

# 胸腔重症醫師於肺移植的角色 - 林口長庚醫院之經驗

林口長庚醫院

胸腔科系 呼吸治療科

胡 漢 忠



# Outlines

- Why we?
- The role of pulmonologist
  - Pretransplant phase
  - Posttransplant phase
  - For donor
- Take home message

- This is a unique experience for pulmonologist
- It is not evidence base, but patient needed base



# Why We?

- Mr. Ruan, 66-year-old
- Occupation: ceramics
- Diagnosis: pneumoconiosis with recurrent pneumothorax
- Oxygen demand at home
- Received lung transplantation at 2016/3
- Patient expired the next day

- What we missed in this patient?
- What we learned?
- Can we do more for this patient?
- Can we do better?



# History of lung transplantation



Joel Cooper, Toronto General hospital

- Omental wrap
- Cyclosporine

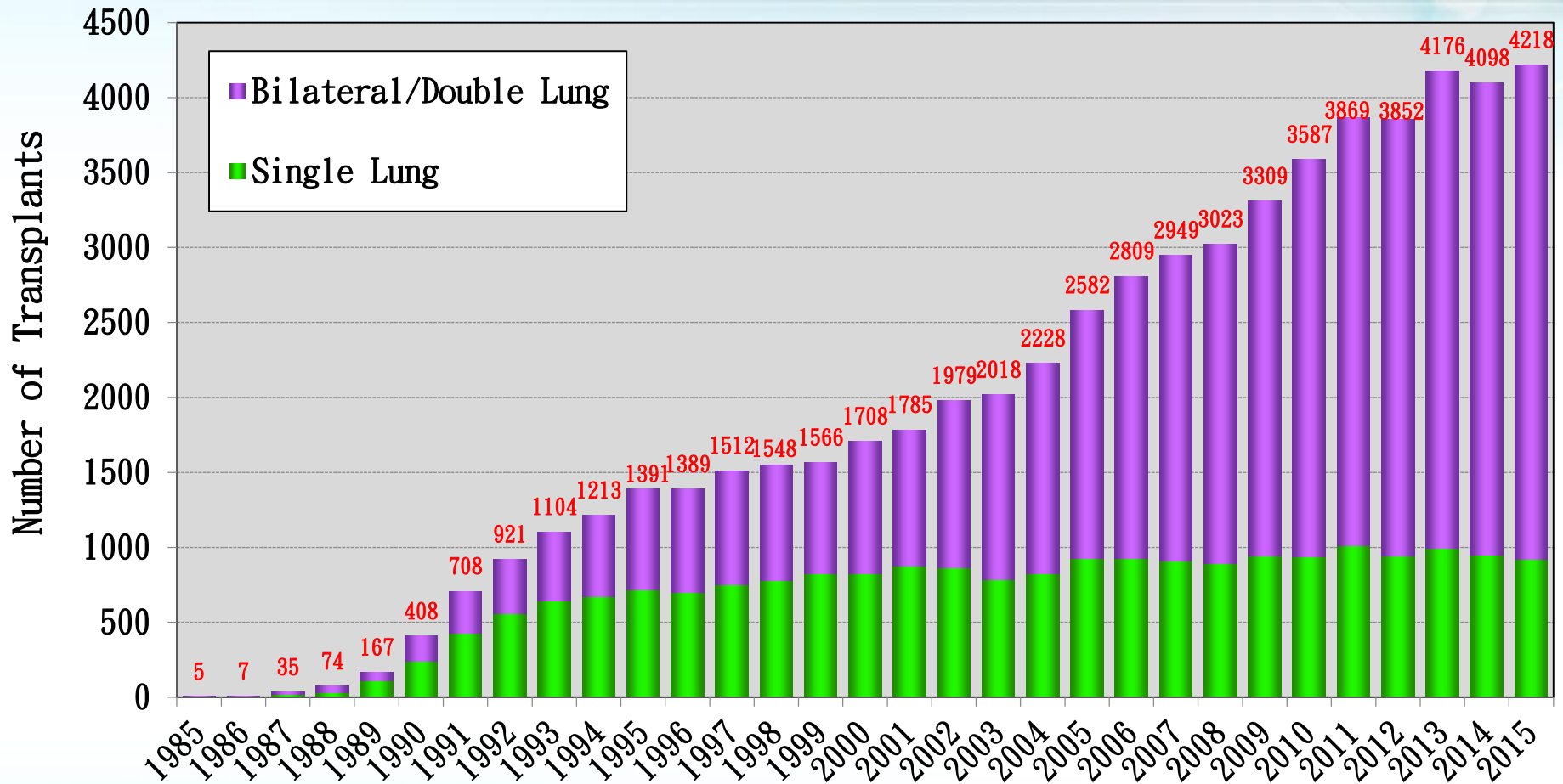
1983 – 1<sup>st</sup> successful human lung transplantation

- 58 y/o. male with IPF, surviving 8 years.

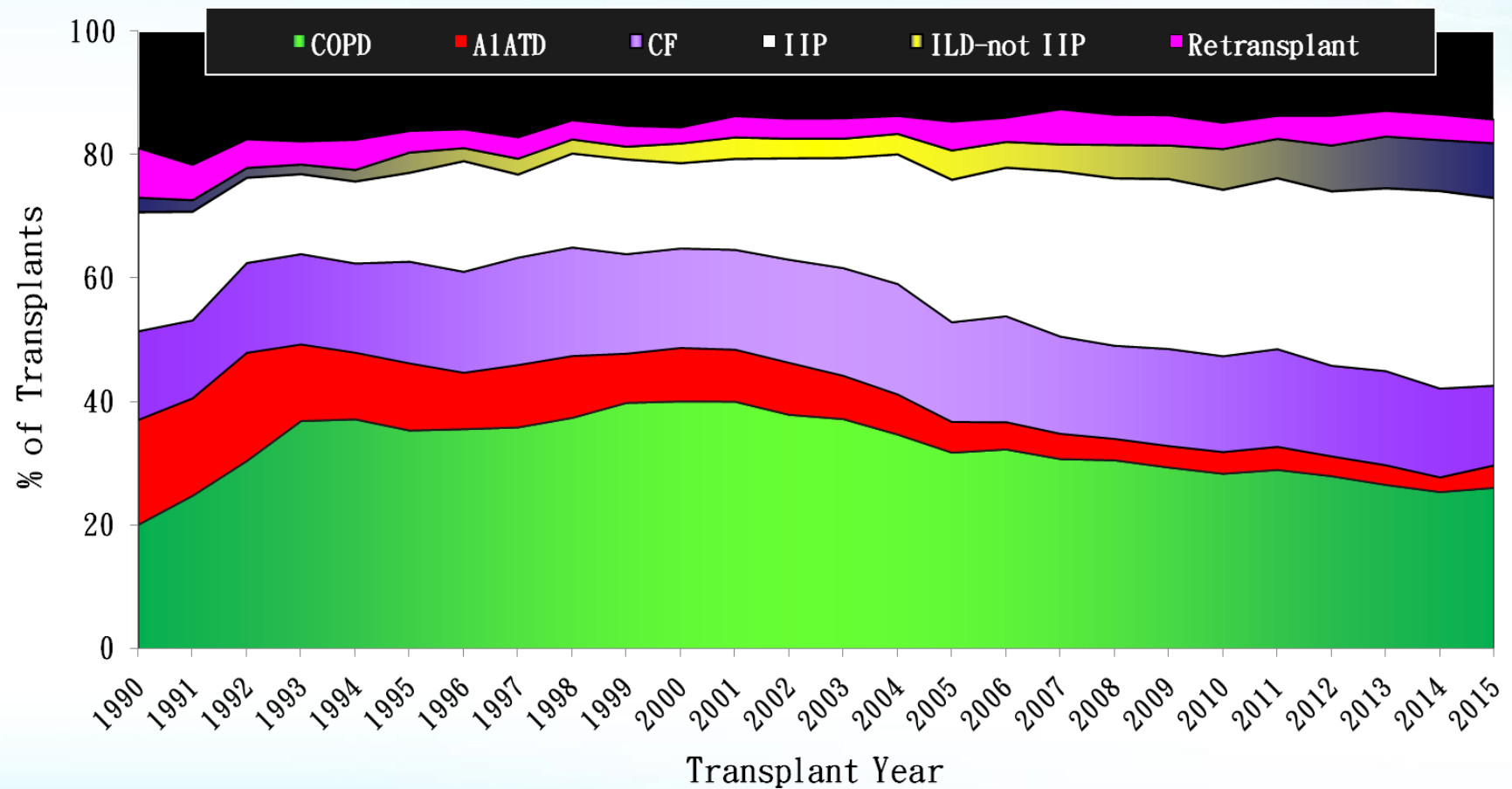
Toronto Lung Transplant Group, Unilateral lung transplantation for pulmonary fibrosis, N Engl J Med 1986:1140-1145.

# Adult and Pediatric Lung Transplants

## Number of Transplants by Year and Procedure Type



# Major Indications by Year (%)





NTUH



CGMH



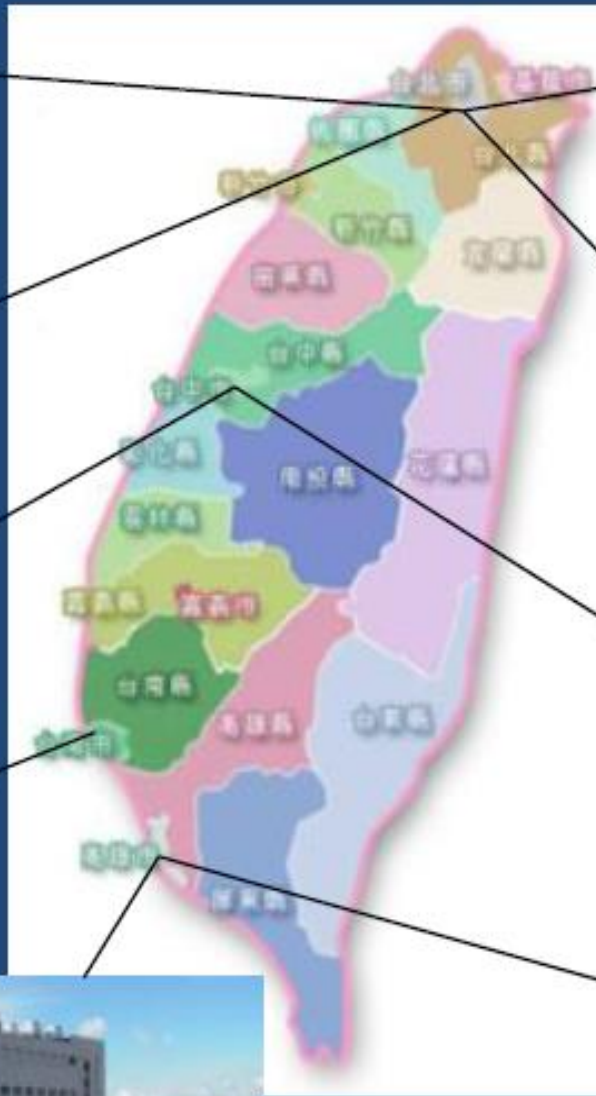
CMUH



NCKUH



KMUH



VGH, Taipei



TSGH



VGH, Taichung



VGH, Kaohsiung



# Lung transplantation in Taiwan

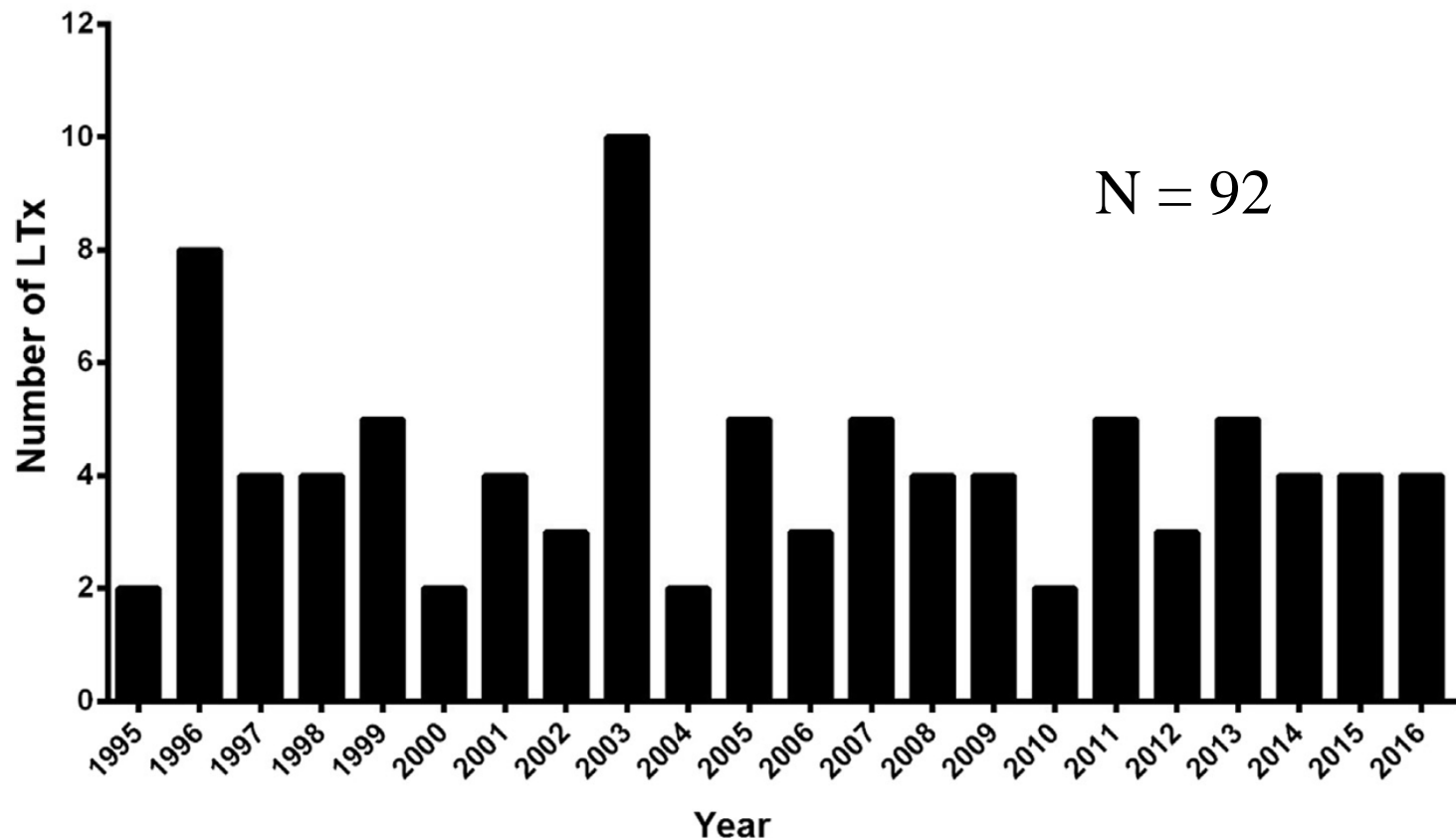


Figure 1 Number of lung transplantations.

**Table 1** Demographic and preoperative characteristics.

Recipient demographic	1995/12–2006/06 (N = 50)	2006/07–2016/08 (N = 42)	p-value
	NO.(%) or mean $\pm$ SD	NO.(%) or mean $\pm$ SD	
Age, yr	38.8 $\pm$ 11.6	44.8 $\pm$ 13.4	0.024
BMI	18.8 $\pm$ 3.7	20.0 $\pm$ 4.1	0.155
Sex female	35 (70.0)	22 (52.4)	0.091
<b>ECMO or ventilator support</b>			
ECMO	3 (6.0)	7 (16.7)	0.177
Ventilator	13 (26.0)	28 (66.7)	<0.001
Ventilator use time, days	269.4 $\pm$ 472.0	176.1 $\pm$ 240.7	0.493
<b>Diagnosis</b>			
Bronchiectasis	3 (6.0)	7 (16.7)	0.177
LAM	5 (10.0)	10 (23.8)	0.093
BO	13 (26.0)	6 (14.3)	0.202
PAH	11 (22.0)	7 (16.7)	0.603
Pneumoconiosis	7 (14.0)	3 (7.1)	0.336
IPF	2 (4.0)	2 (4.8)	1.000
COPD	4 (8.0)	2 (4.8)	0.684
Others	5 (10.0)	5 (11.9)	1.000

# Role of Pulmonologist in Lung Transplantation



長庚紀念醫院  
CHANG GUNG MEMORIAL HOSPITAL

# Pre-transplant phase

- Identification of candidates
- Timely referral
- Optimization of recipients
- Treatment of preexisting comorbidities

# Relative contraindications for LTx

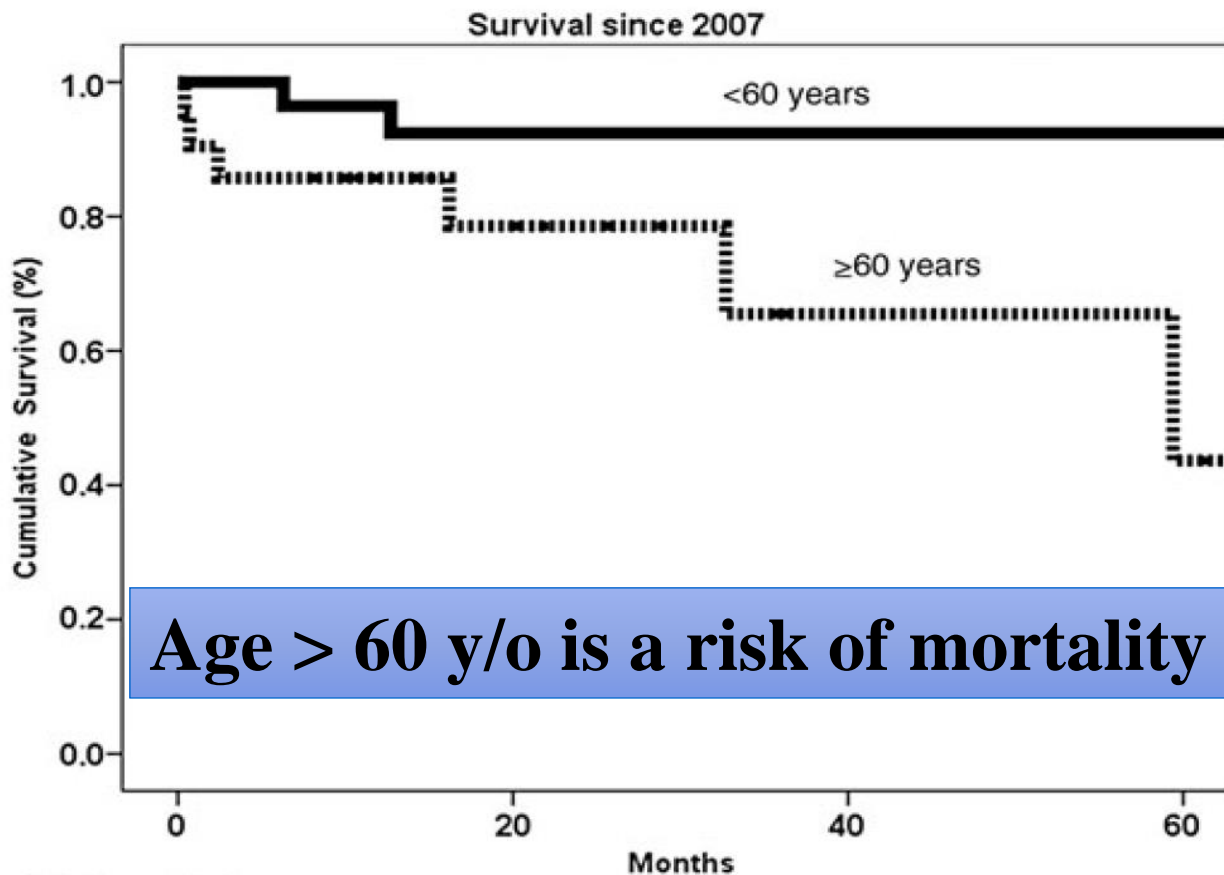
- Age older than 65 years
- Critical or unstable clinical condition
- Severely limited functional status with poor rehabilitation potential
- Colonization with highly resistant or highly virulent bacteria, fungi, or mycobacteria
- Severe obesity defined as BMI exceeding 30 kg/m<sup>2</sup>
- Severe or symptomatic osteoporosis
- Mechanical ventilation
- Other medical conditions that have not resulted in end-stage organ damage, such as DM, HTN, peptic ulcer disease, or GERD should be optimally treated before transplantation



# Lung transplantation for emphysema: impact of age on short- and long-term survival<sup>†</sup>

Ilhan Inci<sup>a,\*</sup>, Macé Schuurmans<sup>b</sup>, Jonas Ehram<sup>a</sup>, Didier Schneider<sup>a</sup>, Sven Hillinger<sup>a</sup>, Wolfgang Jungraithmayr<sup>a</sup>, Christian Benden<sup>b</sup> and Walter Weder<sup>a</sup>

<sup>a</sup> Department of Thoracic Surgery, Zurich University Hospital, Zurich, Switzerland



**Age > 60 y/o is a risk of mortality**

# 台灣肺移植適應症

- (一) Group A 阻塞性肺疾病：符合肺移植適應症之診斷並符合下列任一條件者：
  - 1、 第一秒最大呼氣量 (FEV1.0) < 35 %預測值。
  - 2、 氧合指數 (PaO<sub>2</sub>/FiO<sub>2</sub>) < 300。
  - 3、 血中二氧化碳分壓 (PaCO<sub>2</sub>) 升高。
  - 4、 引起繼發性肺動脈高壓 (mPAP > 25mmHg)。
  - 5、 臨床上活動分級已達紐約心臟協會功能分類第三級或第四級者。
  - 6、 需長期依賴氧氣者。
  - 7、 雖經藥物治療，仍長期有慢性呼吸道感染或已出現呼吸窘迫症狀。



# 台灣肺移植適應症

- (三) Group C 囊性纖維化症或免疫缺乏症 (Cystic Fibrosis)：符合肺移植適應症之診斷並符合下列任一條件者：
  - 1、第一秒最大呼氣量 (FEV1.0) < 40%預測值。
  - 2、血中二氧化碳分壓 (PaCO<sub>2</sub>) 升高。
  - 3、雖經藥物治療無效或情況仍逐漸惡者。

# 台灣肺移植適應症

- （四） Group D 限制性肺疾病：符合肺移植適應症之診斷並符合下列任一條件者：
  - 1、雖經藥物治療無效或情況仍逐漸惡化者。
  - 2、需長期依賴氧氣者。

# Pre-transplant phase

- Identification of candidates
- Timely referral
- Optimization of recipients
- Treatment of preexisting comorbidities

**Most importance, permit thorough evaluation**

# ISHLT lung transplantation guideline for COPD

- Guideline for referral
  - BODE > 5
- Guideline for transplantation
  - Patient with BODE 7~10 or with at least one of following:
    - History of hospitalization for exacerbation with associated with acute hypercapnia ( $\text{PaCO}_2 > 50\text{mmHg}$ )
    - Pulmonary hypertension, cor pulmonale, or both despite oxygen therapy
    - $\text{FEV1} < 20\%$  and either  $\text{DLCO} < 20\%$  or homogenous distribution of emphysema

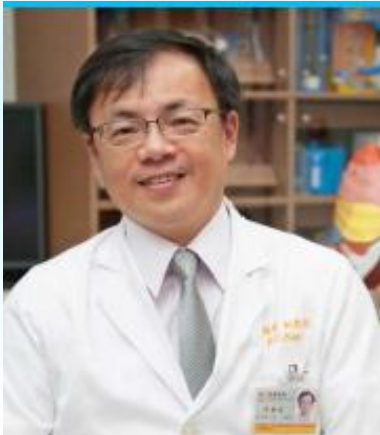
# ISHLT guideline for IPF

- Guideline for referral
  - Histologic or radiographic evidence of UIP irrespective of vital capacity
  - Histologic evidence of fibrotic NSIP

- In U,S, average 300 patients die annually while waiting for lung transplants
- In CGMH, there is 10 patients die during waiting for transplantation in recent 3 years



Early identification and timely referral



## 肺移植團隊會議： 高國晉教授/劉永恆教授 主持 (呼吸治療科會議室)



無移植  
病患住院

- 每周五固定團隊會議  
(討論病例、文獻研讀、  
心得報告)

有移植  
病患住院

- 隨時線上討論
- 每周二、五兩次全團  
隊討論病情



**Anesthesia**

**Cardiothoracic  
Surgery**

**Pulmonology**

**Coordinator**

**Respiratory  
therapist**

**NP/PA  
Nurses**

## **Multidisciplinary team**

**Pharmacist**

**Infectious  
Disease**

**Dietitian**

**Cardiologist**

**Physiatrist**

**Psychiatrist**

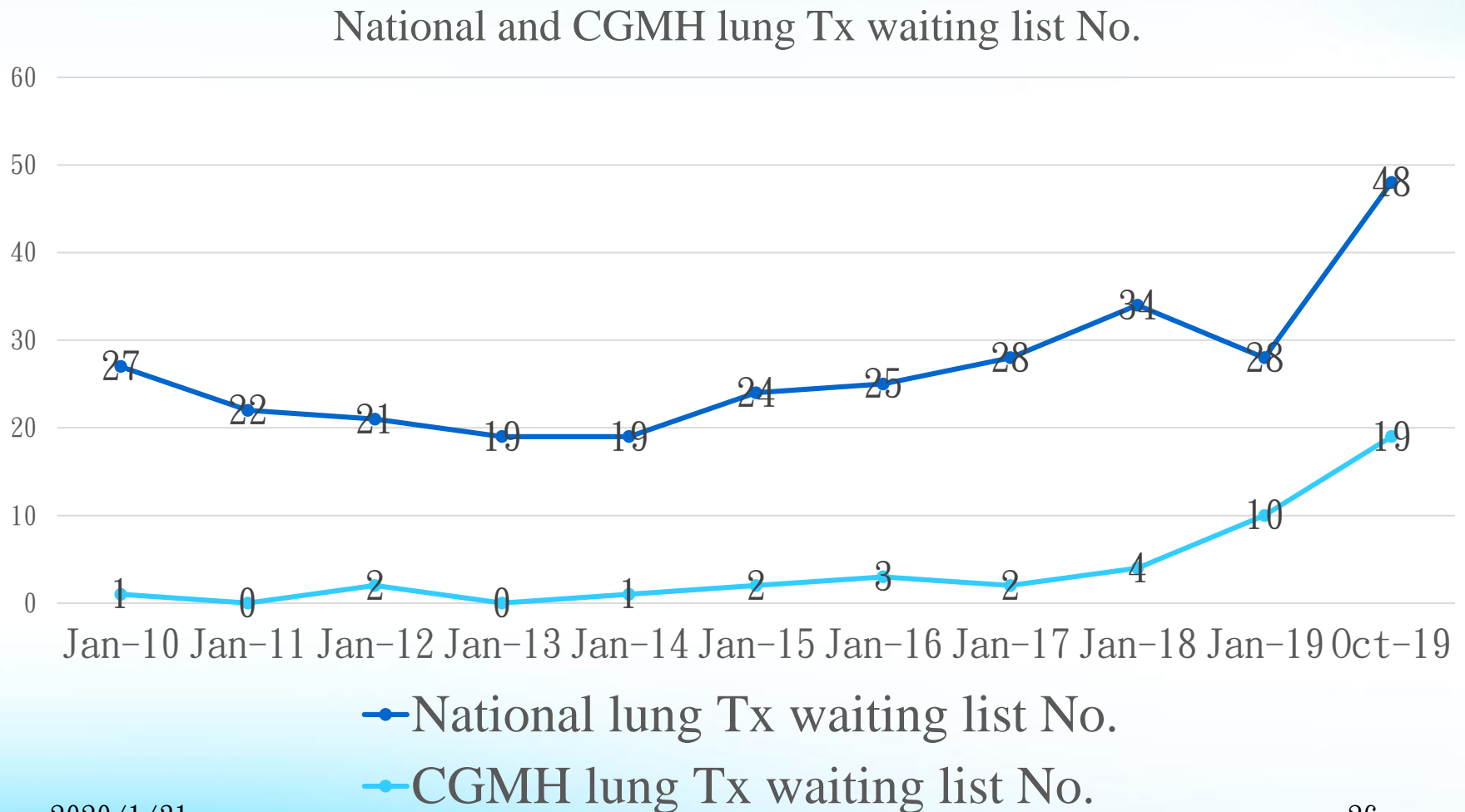
**Nephrologist**



# Screening patients

血型	性別	出生年月日	現在年齡	照會日期	照會年齡	照會醫師	診斷
A+	男	1969/5/3	50	2017/4/12	47	高國晉	IPF
O+	男	1953/9/20	63	2017/4/13	63	郭志熙	IPF
A+	男	1954/8/25	65	2017/4/17	62	胡漢忠	IPF
B+	男	1960/7/10	59	2017/4/15	56	王才郁	COPD
	男	1960/3/9	57	2017/4/18	57	黃建達	COPD
O+	男	1958/10/9	61	2017/4/18	58	王圳華	IPF
O+	男	1958/2/20	61	2017/4/21	59	張博瑞	COPD
O+	男	1967/2/25	52	2017/5/8	50	邱立忠	IPF
B+	男	1960/7/7	59	2017/5/18	56	高國晉	IPF, Scleroderma
	男	1951/10/1	65	2017/5/25	65	莊立邦	IPF
	女	1969/7/10	50	2017/6/13	47	陳志弘	destructive lung
O+	男	1949/7/10	68	2017/7/17	68	林鴻銓	IPF

# Taiwan and CGMH lung transplant waiting list number



# Pre-transplant phase

- Identification of candidates
- Timely referral
- Optimization of recipients
- Treatment of preexisting comorbidities

## Pulmonary rehabilitation in lung transplant candidates

Melinda Li, MD,<sup>a</sup> Sunita Mathur, PhD,<sup>b</sup> Noori A. Chowdhury, MPH,<sup>c</sup> Denise Helm, BSc, PT,<sup>b,c</sup> and Lianne G. Singer, MD<sup>a,c</sup>

- Exercise capacity preserved among lung transplant candidates participating in PR
- Candidates with greater exercise capacity have more favorable early post-transplant outcomes



# Guidelines for pre-transplant exercise prescription

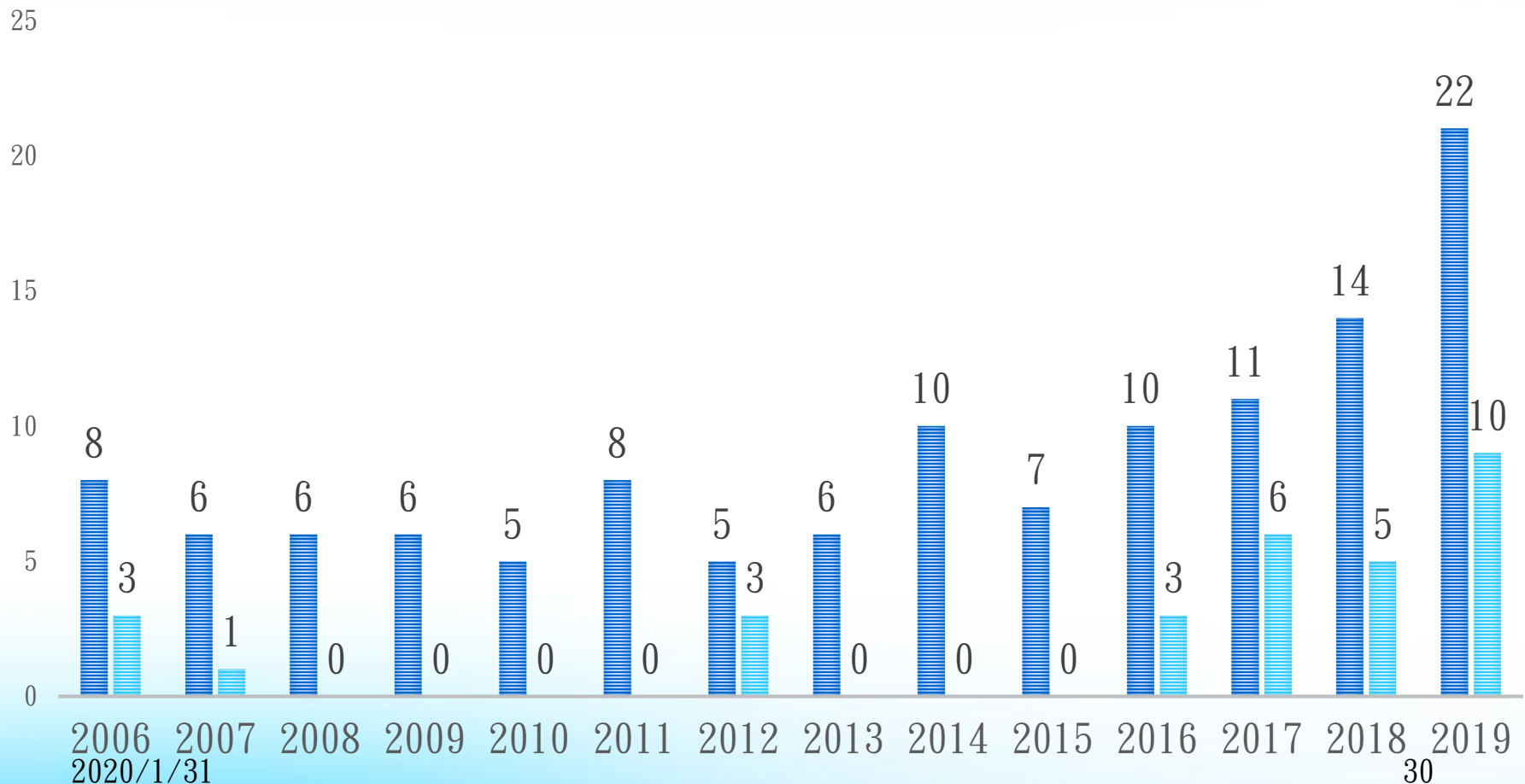
	Aerobic	Resistance	Flexibility
<b>Frequency</b>	2-5 d/wk	2-3 d/wk	3-5 d/wk
<b>Intensity</b>	<ul style="list-style-type: none"> <li>•50%-80% THR</li> <li>•Modified Borg scale(3-5)</li> <li>•<u>SpO<sub>2</sub> &gt; 85%-90%</u></li> </ul>	•30%-80% 1-RM	
<b>Type</b>	<ul style="list-style-type: none"> <li>•Walking :treadmill</li> <li>•Cycling : ergometer</li> </ul>	•Major muscle groups of upper and lower body	•Thoracic cage and chest wall mobility
<b>Time/Training Volume</b>	<ul style="list-style-type: none"> <li>•Continuous: 15-30min</li> <li>•Interval:12-36 min</li> </ul>	•1-2 sets × 8-15 reps	•Hold up to 10-30 s , repeat 2-4 times
<b>Progression</b>	•Perform regular 6MWTs and increase Watts on cycle	•Increase weights based on tolerance	•Hold stretches to point of tightness or slight discomfort

*World J Transplant, 6(3), 517-531.*

# Taiwan and CGMH lung transplant number

## LUNG TRANSPLANT NO.

■ National lung Tx No.    ■ CGMH lung Tx No.

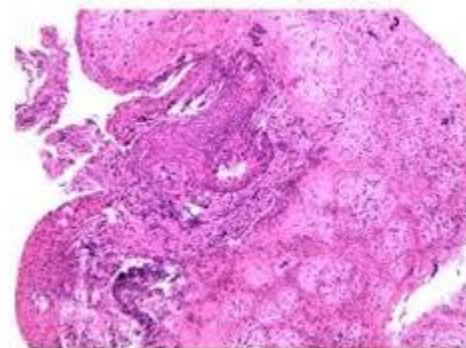


# Post-transplant phase

## ■ Comprehensive care

- Management of rejection and infection
- Avoided drug interactions
- Acute humoral rejection
- Management of complications
  - Chronic rejection
- Health maintenance

Regular follow up PFT, 6MWT, TBLB at 1,3,6 M



# Post-transplant phase

## ■ Comprehensive care

- Management of rejection and infection
- Avoid drug interactions
- Management of complications
- Health maintenance



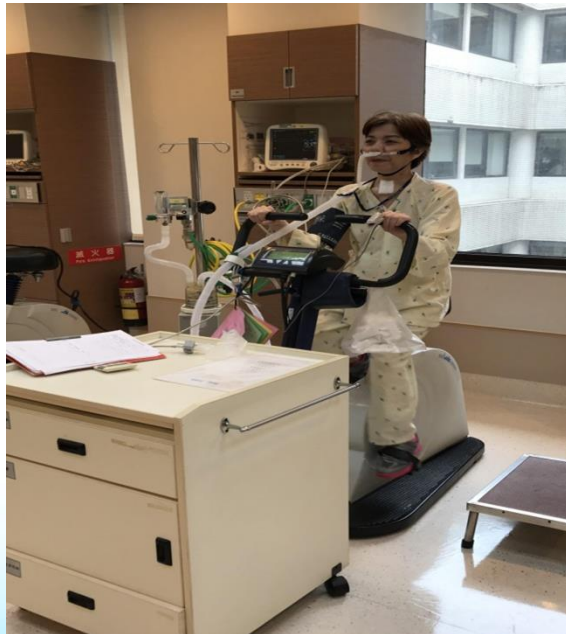
# Guidelines for early post-transplant exercise prescription

	<b>Aerobic</b>	<b>Resistance</b>	<b>Flexibility</b>
<b>Frequency</b>	3-5 d/wk	2-3 d/wk	3-5 d/wk
<b>Intensity</b>	<ul style="list-style-type: none"> <li>•50%-80% THR or &lt; 85% age-predicted HR max</li> <li>•Modified Borg scale(3-5)</li> <li>•<u>SpO2 &gt; 88%</u></li> </ul>	<ul style="list-style-type: none"> <li>•60%-80% 1-RM</li> </ul>	
<b>Type</b>	<ul style="list-style-type: none"> <li>•Walking :treadmill</li> <li>•Cycling : <b>ergometer</b></li> </ul>	<ul style="list-style-type: none"> <li>•<u><b>Avoid abdominal muscle exercises for first 3 month</b></u></li> </ul>	<ul style="list-style-type: none"> <li>•Thoracic cage and chest wall mobility</li> </ul>
<b>Time/Training Volume</b>	<ul style="list-style-type: none"> <li>•Continuous: 20-30min</li> </ul>	<ul style="list-style-type: none"> <li>•1-3 sets × 8-15 reps</li> </ul>	<ul style="list-style-type: none"> <li>•Hold up to 10-30 s , repeat 2-4 times</li> </ul>
<b>Progression</b>	<ul style="list-style-type: none"> <li>•Perform regular 6MWTs and increase Watts on cycle</li> </ul>	<ul style="list-style-type: none"> <li>•Increase weights based on tolerance</li> </ul>	<ul style="list-style-type: none"> <li>•Hold stretches to point of tightness or slight discomfort</li> </ul>

# Guidelines for long-term post-transplant exercise prescription

## ➤ Functional goals in the outpatient phase

- ambulation without gait aids
- liberation from supplemental oxygen
- return to pre-transplant muscle strength
- 6MWD of 65%-85% predicted levels.
  - ✓ 6MWD showing a slow improvement over 12 to 18 months
- The optimal time for return to work is suggested to be around 1 year after transplantation



# Brief outcome since 2016 at CGMH

- Mean age: 60 y/o
- Sex (M:F): 19: 4
- Diagnosis :
  - IPF : 7
  - COPD : 8
  - Pneumoconiosis : 3
  - iPAH : 2
  - OB : 2
  - Bronchiectasis: 1
  - Scleroderma : 1
  
- Hospital stay: 40 days
- 1-month survival : 95.6%
- 3-month survival: 86.9%

# Role of Pulmonologist – for Donor

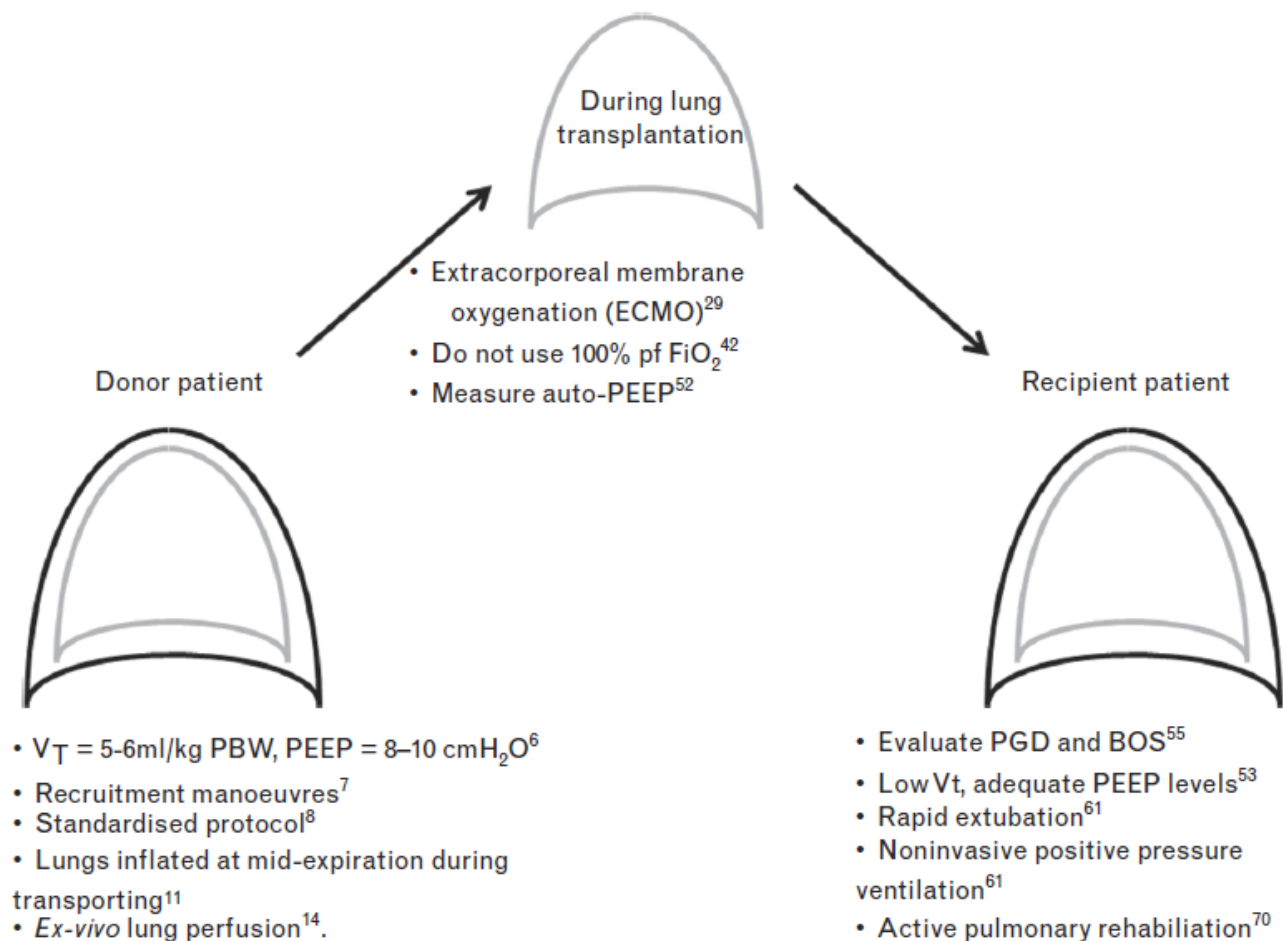




# Organ donation in Taiwan

- 14.2 / 1 million
  - Spain 48 / million ; Belgium 33.4/ million ; US 33.3 / million
- Around organ 200 donors / year
- Only around 10 lung transplantation / year in Taiwan
- Donor lung usage rate: 5% (21.4 % in US)
  - Donor criteria
  - Donor care

Fig. 1



Main prevention and treatment approaches for each stage of lung transplantation: donor care, intraoperative and postoperative. BOS, bronchiolitis obliterans syndrome;  $\text{FiO}_2$ , inspiratory fraction of oxygen; PEEP, positive end-expiratory pressure; PGD, primary graft dysfunction;  $V_T$ , tidal volume.

# Lung-protective strategies for donor lungs

- Protective ventilation can be applied to donor lungs
  - Keep alveolar units stable
  - Maintain their volume for the transplantation process
- A multicenter, RCT, Ventilation with
  - $V_T$  of 5 to 6 ml/Kg, PEEP of 8 to 10 cmH<sub>2</sub>O
  - $V_T$  of 10 to 12 ml/Kg, PEEP of 3 to 5 cmH<sub>2</sub>O
- ➔ Doubled the number of eligible lungs
- Recruitment maneuvers
  - Sustained inflation of 30 cmH<sub>2</sub>O for 30 s
  - Improve oxygenation
  - Increase the overall donor pool



# Lung-protective strategies for donor lungs

- Angel LF et al. Reported
  - San Antonio protocol
  - Recruitment maneuvers during pressure-controlled ventilation
    - Inspiratory pressure: 25 cmH<sub>2</sub>O and PEEP: 15 cmH<sub>2</sub>O for 2 h
    - PaO<sub>2</sub>/FiO<sub>2</sub> ratio > 300, > 30 min
- ➔ Volume-control ventilation
- Outcome
  - 4 years before and after introducing the lung protection protocol
  - Improved oxygenation (PaO<sub>2</sub>/FiO<sub>2</sub> ≥ 300) in 21% of those initially classified as poor donors

# Take Home Message

- Lung transplant in CGMH is a team work, we are recipients, also are donors
- Early detect candidates, timely referral is gold standard
- Pulmonologist play an important role in the pre- and post-transplant phase

# 2018年11月12日 大合照



# 2019年4月13日 肺移植病友會成立



## 自由呼吸真好! 肺臟移植病友醫療座談會

為使肺臟移植病友及家屬獲得移植術後照護相關知識，社服課與肺臟移植團隊特別舉辦肺臟移植病友醫療座談會，歡迎踴躍參加！

- 活動時間：2019年4月13日(六)9：00-12：00
- 活動地點：林口長庚紀念醫院 醫學大樓五樓內科會議室
- 活動流程：

時間	活動內容	講師
09：00～09：20	報到	
09：20～09：30	全家福大合照	
09：30～09：40	致詞 高國晉 副主任 劉永恆 主任	主持人 胡漢忠 主任
09：40～10：00	專題演講 手術後服用藥物注意事項	江俐慧 藥師
10：00～10：30	專題演講 手術前後的營養攝取	張書華 營養師
10：30～11：00	病友經驗分享	林淑華 女士
11：00～12：00	醫療座談 Q&A	陳維勳 醫師 肺移植團隊

報名專線：呼吸復原中心 03-3281200 分機 2671



製作單位：社服課

負責人員：謝書豪

聯絡電話：3284







**Thanks for your attention!!**

