Assessment Recovery Center in the UK (ARC)

Ex Vivo Lung Perfusion (EVLP)

NHS BLOOD AND TRANSPLANT
ORGAN AND TISSUE DONATION AND TRANSPLANTATION DIRECTORATE
NHSBT LUNG SUMMIT: February 2023

Hassiba Smail

Cardio-thoracic transplant surgeon , Wythenshawe hospital, Manchester , UK

Evolution of the donor lung criteria over time

Is The marginal donor becoming the standard donor ?

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20 years ago

Box 1
Ideal donor lung selection criteria

1. Age less than 55 years
2. ABO blood group compatible, DBD donor
3. Appropriate size match
4. Clear chest radiograph
5. Pao_2/fraction of inspired oxygen (FIo_2) >300 on 5 cm H_2O positive end-expiratory pressure (PEEP)
6. Tobacco history of less than 20 pack years
7. Absence of chest trauma
8. No evidence of aspiration or sepsis
9. Absence of purulent secretions at bronchoscopy
10. Absence of organisms on sputum Gram stain
11. No history of primary pulmonary disease or active pulmonary infection

Data from Refs.[3,4,20]

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Data from Refs.[3,4,20]

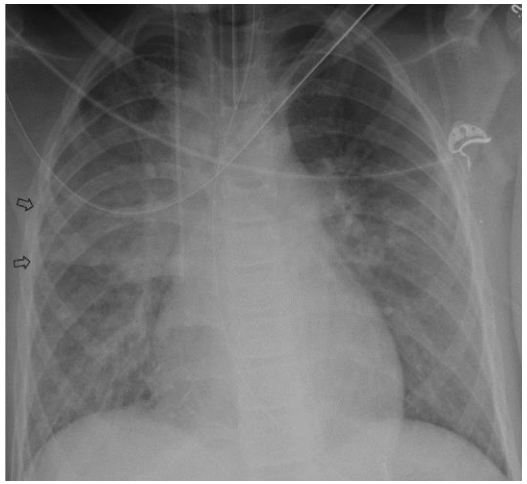
NOW

1. Age < 70 years
2. ABO blood group compatible
3. Donation after brain death or donation after cardiac death donor
4. Approximate size match with minor surgical trimming or lobectomy as needed
5. Minor diffuse and moderate focal chest radiographic changes acceptable if good, stable/improving function
6. PaO_2:FiO_2 > 250 on 5 cm H_2O positive end-expiratory pressure
7. Tobacco history < 40 pack-years
8. Chest trauma not relevant if good function
9. Aspiration or minor sepsis acceptable if good, stable/improving function
10. Purulent secretions not relevant if good, stable/improving function
11. Organisms on Gram stain and ventilation time not relevant
12. Primary donor pulmonary disease not acceptable, unless asthma
13. Lungs deemed initially unacceptable but are resuscitated with ex vivo lung perfusion

Future acceptability considerations:

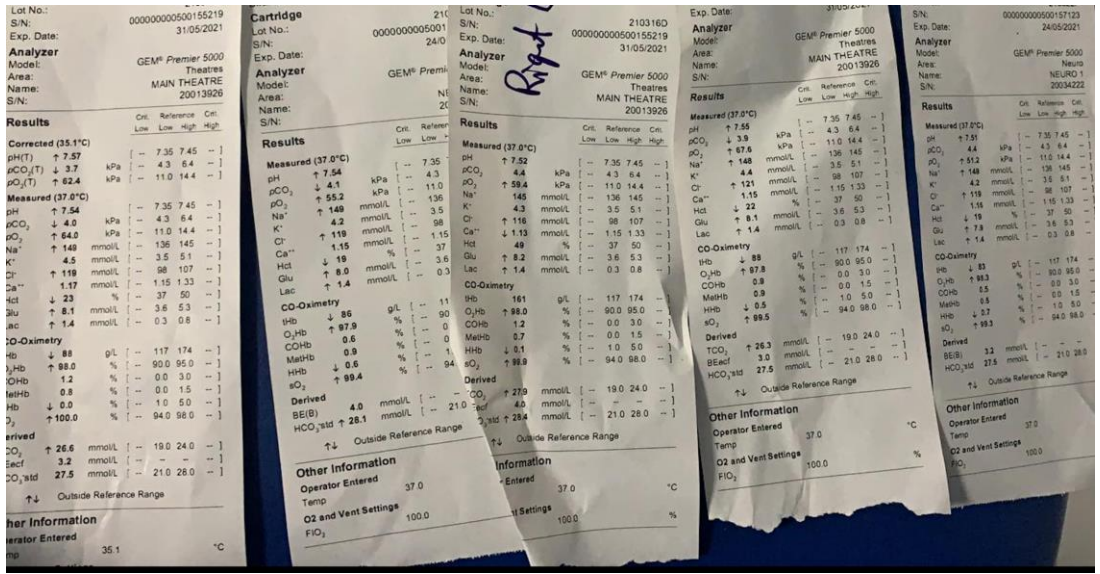
1. Age acceptance up to 75 years
2. ABO incompatible transplant acceptable if low titer recipient and antibody removal and monitoring plan
3. Lobar cut-downs of larger donor acceptable
4. Moderate and/or one-sided chest radiographic changes acceptable with good, stable/ improving function
5. Novel predictive donor factor recognition: donor diabetes, recent smoking history, etc.

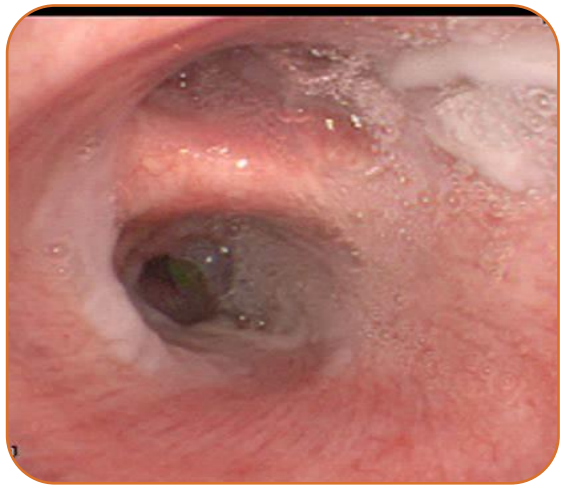
Current lung donor assessment



Not pretty but good gas

Blood gas : PO2/FIO2 >300mmHg ?





Secretions / pus ?

Lung donor assessment during retrieval

Grey ?
Barotrauma?
Blebs? Bullae ?

Heavy lungs ?

Lower lobe consolidation
Atelectasis ?
Infection ?

DCD retrieval
Difficult to assess

Clots in the lungs ?
One or two ?

Lung transplant current situation

Increase mortality on the waiting list

Increase lung transplant demand

Reduced transplant opportunities

Covid pandemic

DBD lung donor utilisation : 14 %
DCD lung donor utilisation: 5.2 %

Precision medicine level

Precision medicine level

- **Taking transplantation to the next level**

Precision medicine level

- Taking transplantation to the next level
- **Transition of organ management from macroscopic assessment to precision medicine level**

Precision medicine level

- Taking transplantation to the next level
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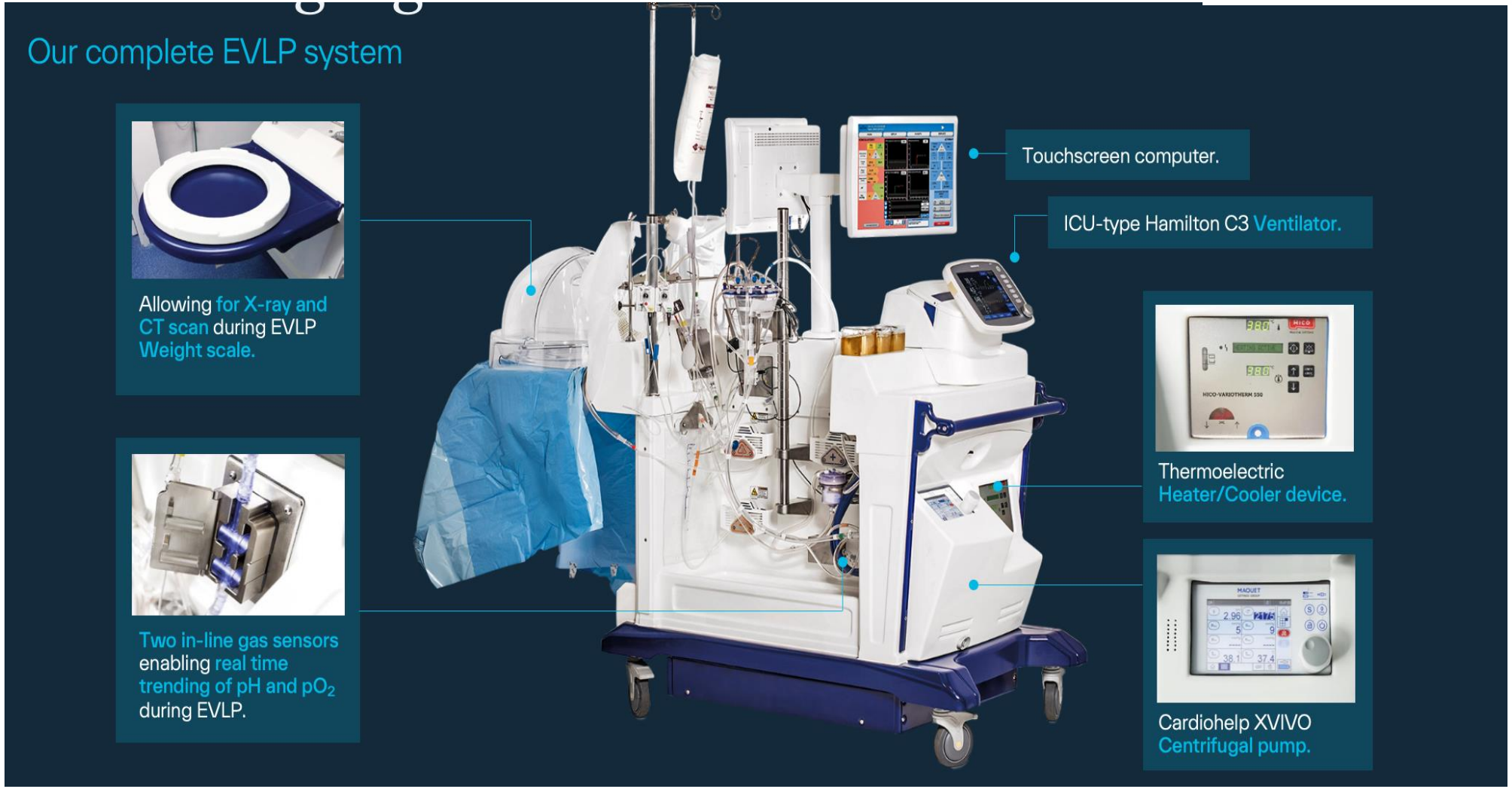
- **Improve organs and prevent deterioration**
- **Increase organ utilization**

Precision medicine level

- Taking transplantation to the next level
- Transition of organ management from macroscopic assessment to precision medicine level
- Improve organs and prevent deterioration
- Increase organ utilization
- **Using available technology**

Ex vivo lung perfusion (XPS)

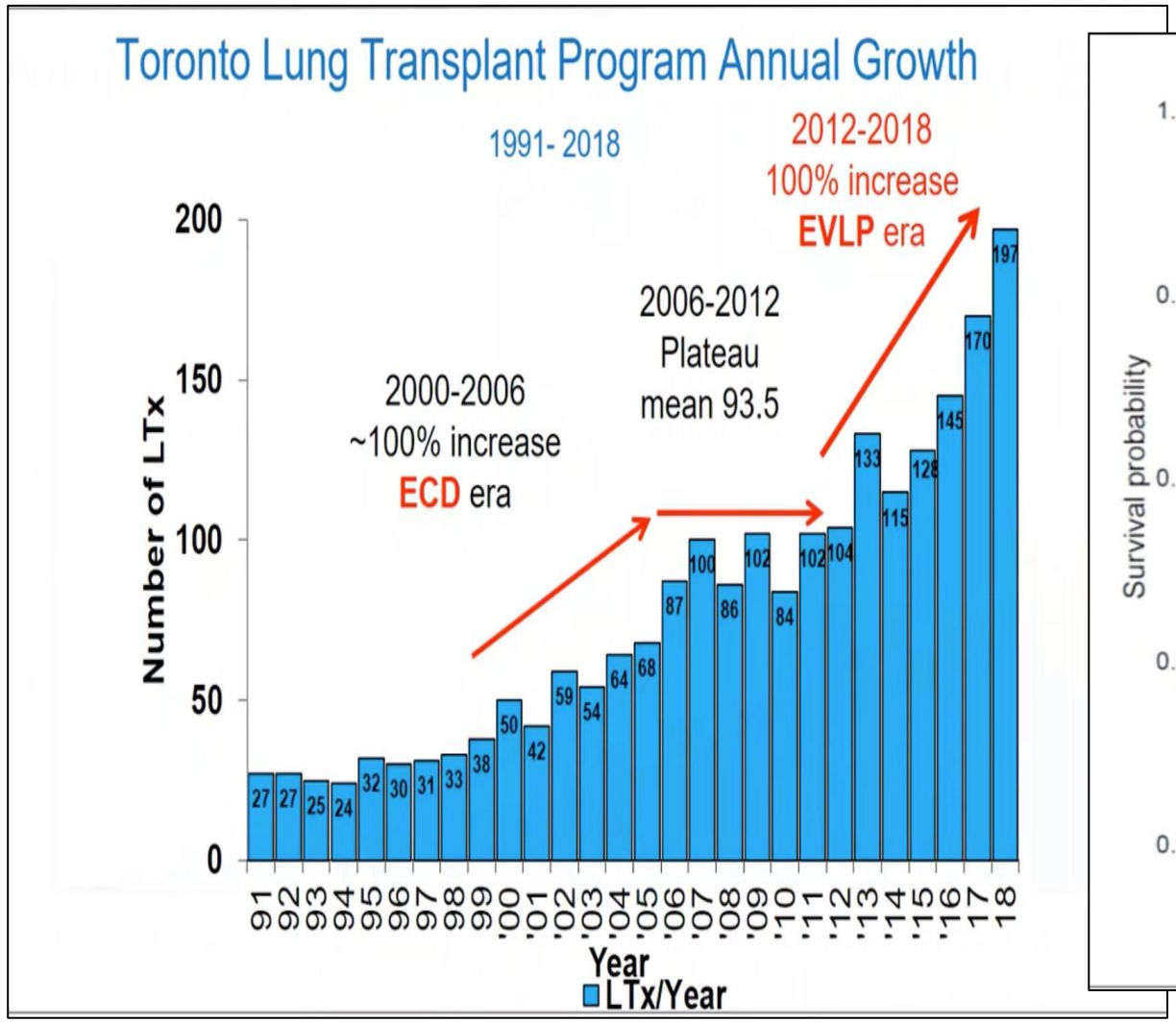


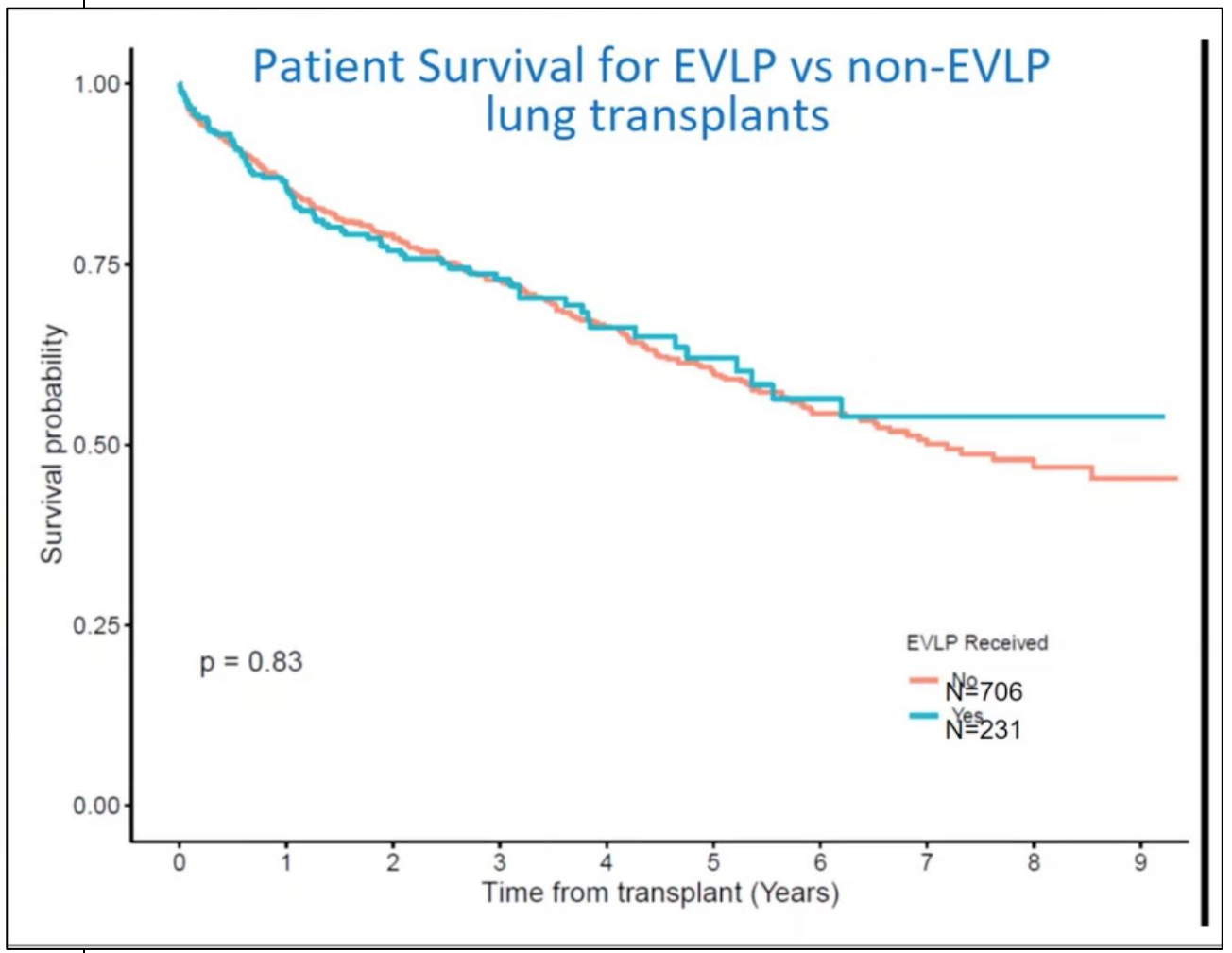
Is “lung assessment and recovery centre” using EVLP one possible answer to organ shortage ?

How to do EVLP?

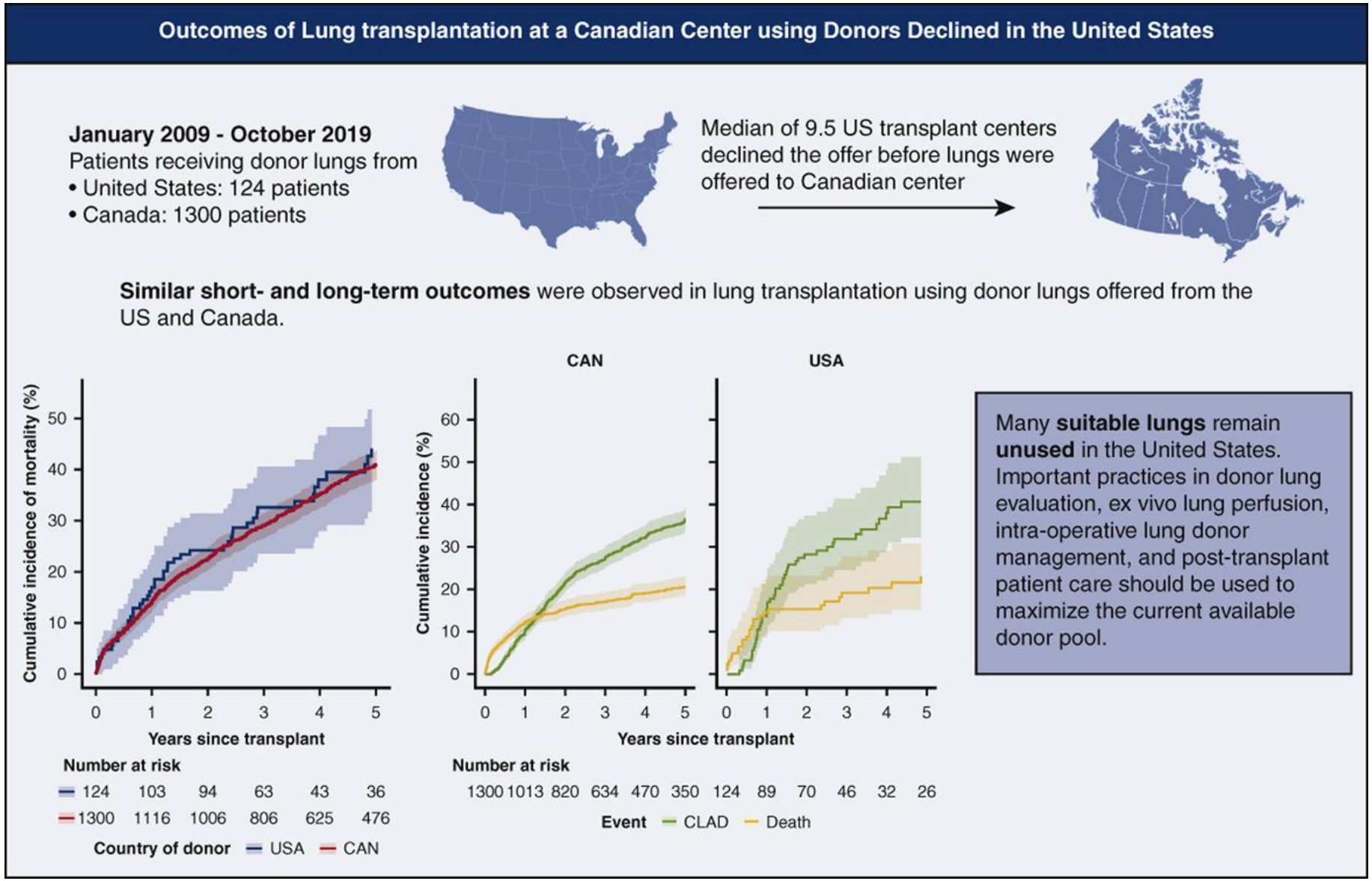
- Do It yourself

Do It yourself : from small to large center
Toronto experience





Crossing the Americans borders



How to do EVLP?

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- Service provider: Someone does it for you

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American Journal of Transplantation 2012; 12: 2838–2844
Wiley Periodicals Inc.

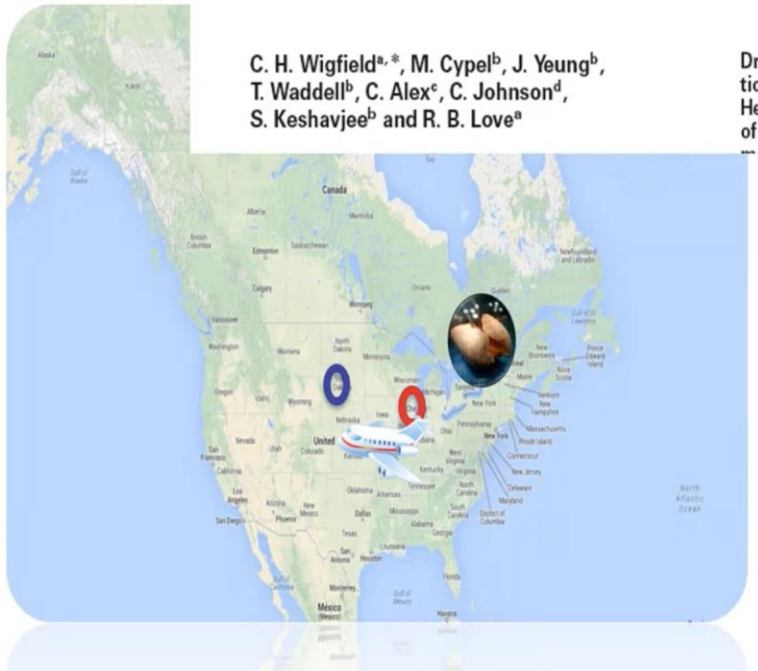
doi: 10.1111/j.1600-6143.2012.04175.x

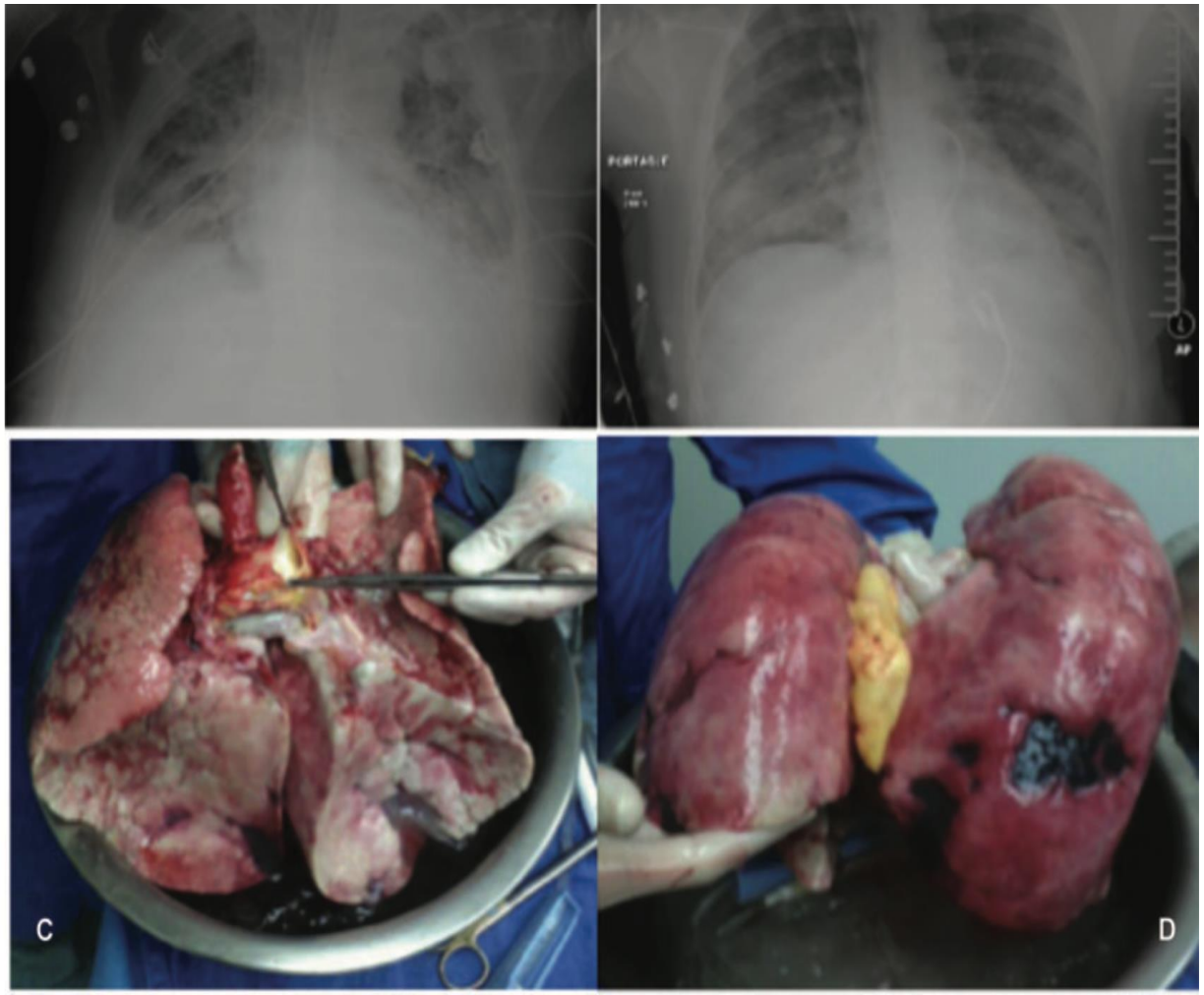
Case Report

Successful Emergent Lung Transplantation After Remote *Ex Vivo* Perfusion Optimization and Transportation of Donor Lungs

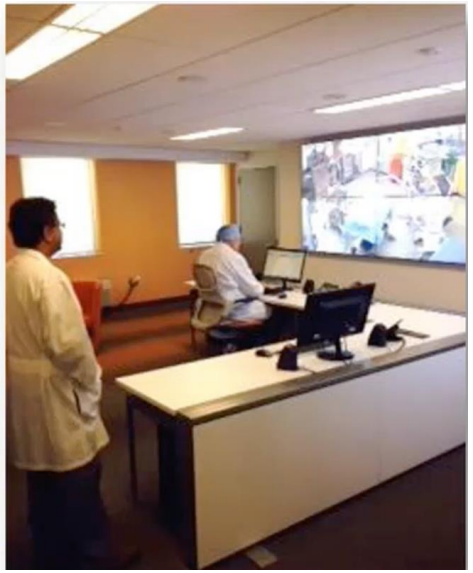
C. H. Wigfield[a,*], M. Cypel[b], J. Yeung[b], T. Waddell[b], C. Alex[c], C. Johnson[d], S. Keshavjee[b] and R. B. Love[a]

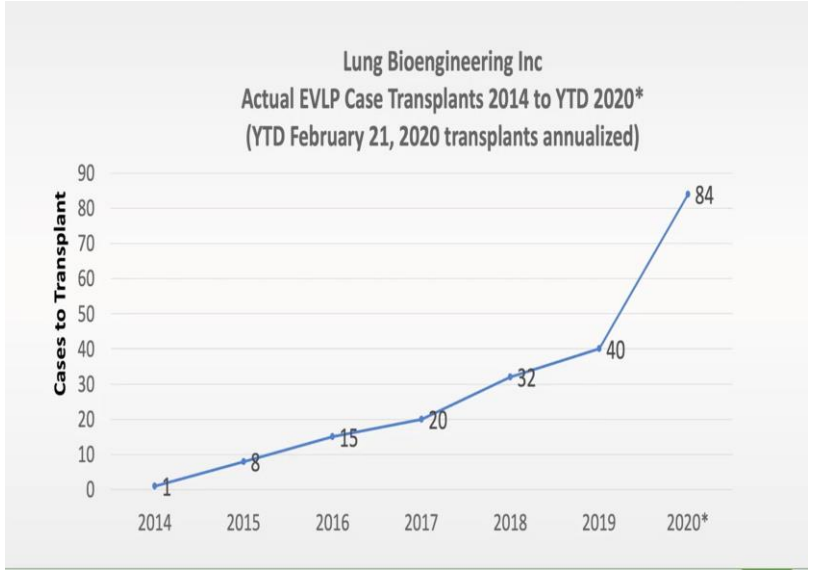
Drug Administration; HCO, Bicarbonate; IRB, Institutional Review Board; ISHLT, International Society of Heart and Lung Transplantation; mmHG, Millimeters of Mercury; mmol/L, Millimolar; OPO, Organ Procure-





Evolution of the first Organ repair center





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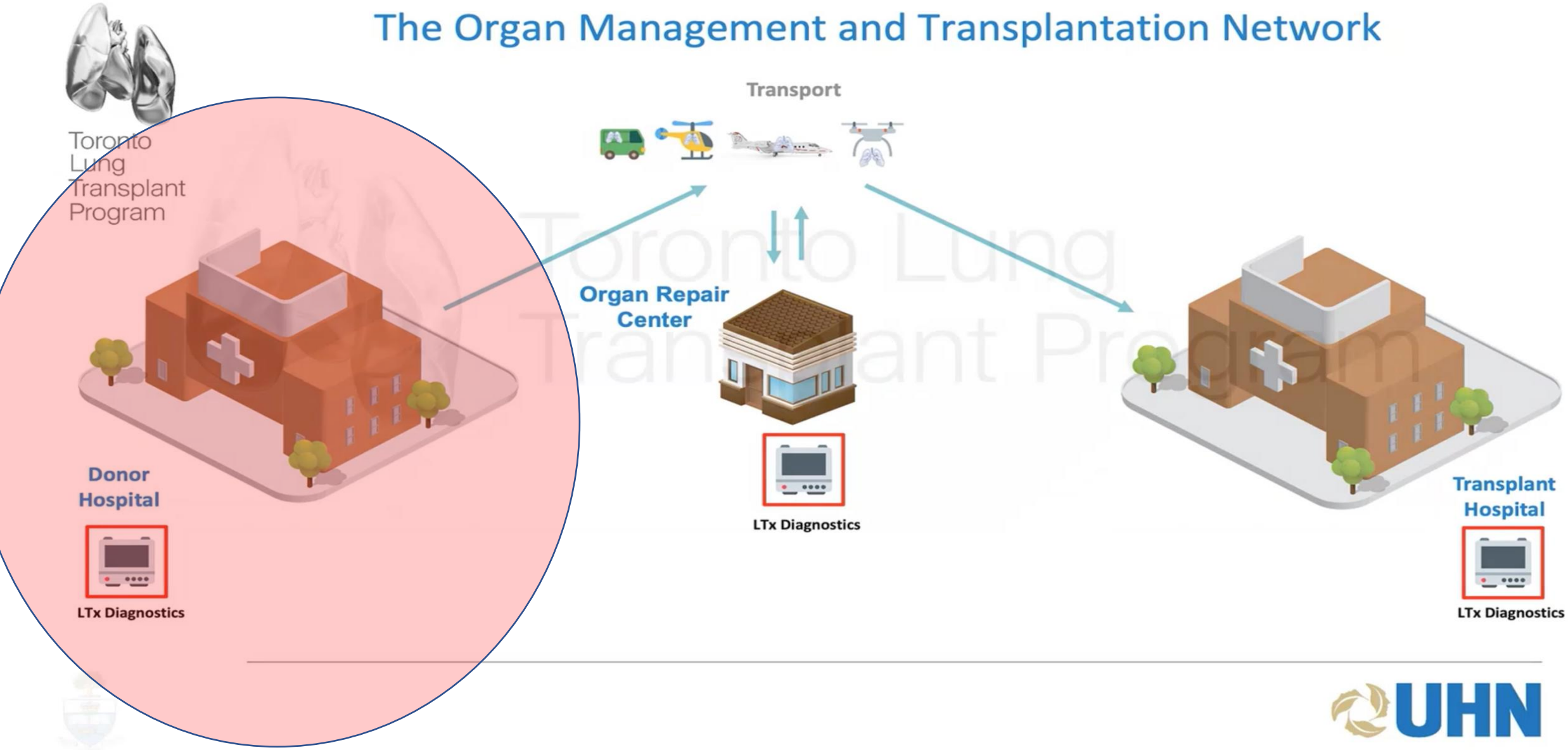
The Organ Management and Transplantation Network



With UHN permission / Toronto group, Marcelo Cypel

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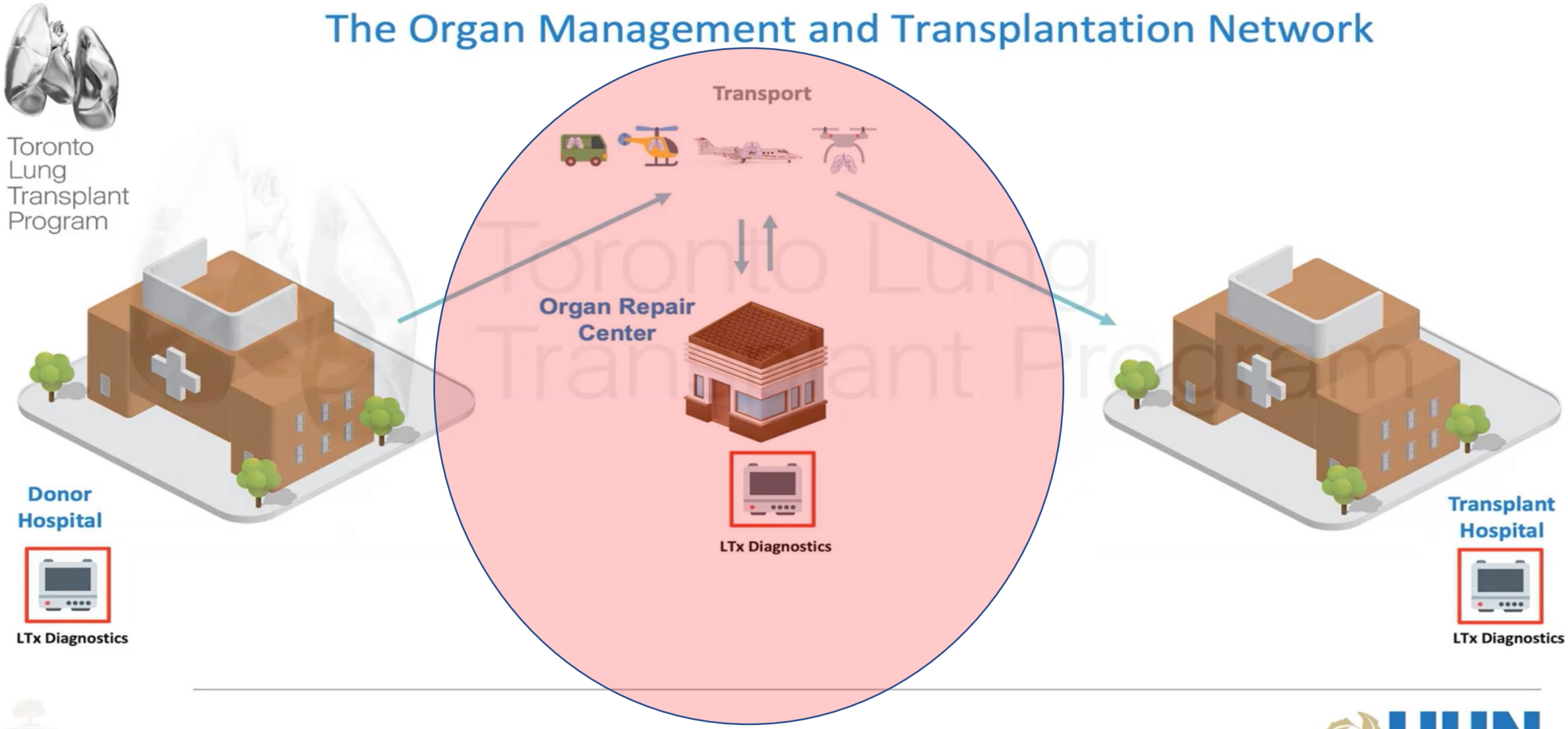

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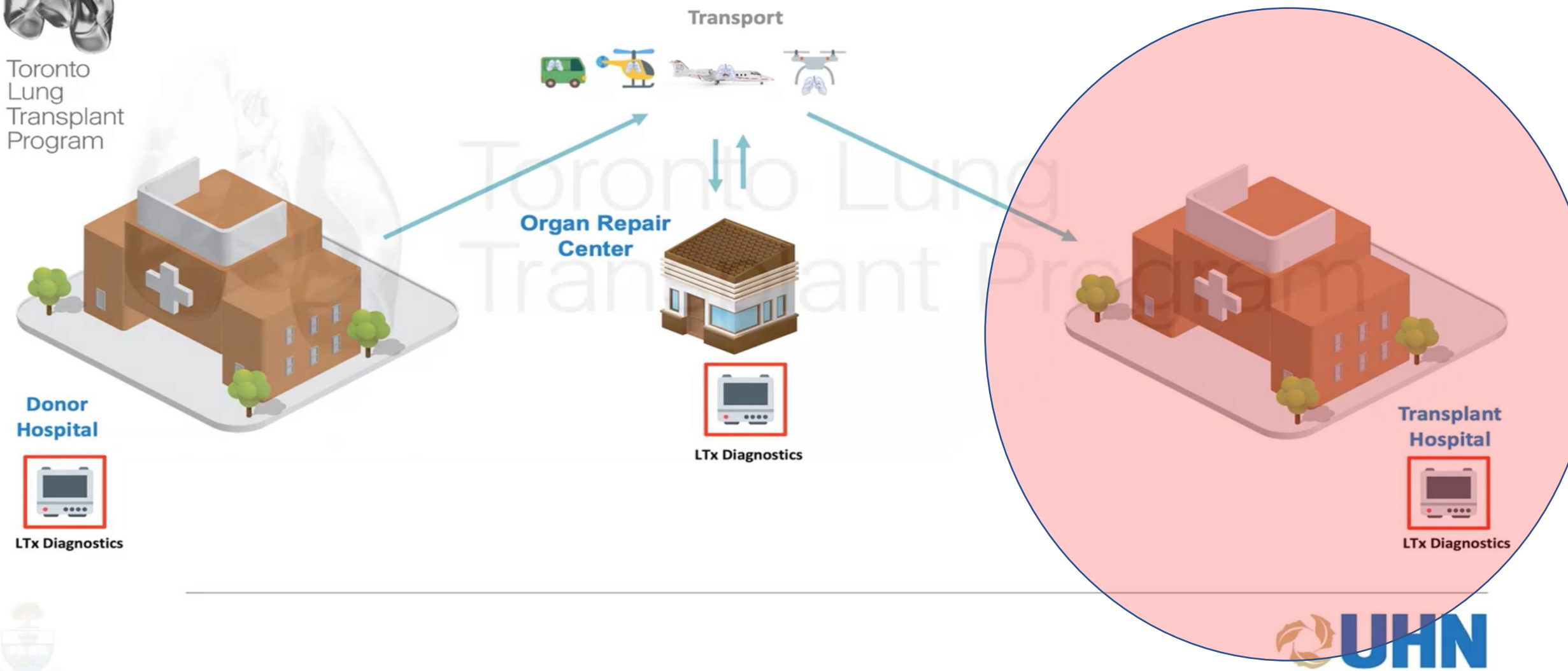
Toronto Lung Transplant Program



UHN

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Remote ex vivo lung perfusion at a centralized evaluation facility

- **Prospective , multicentre study , 7 centres USA , 530 miles**
- **CLES : Maryland**
- **Safety and feasibility**
- **Use of declined organs (marginal) for standard transplant**

Jorge M. Mallea et al J Heart Lung Transplant 2022;41:1700–1711

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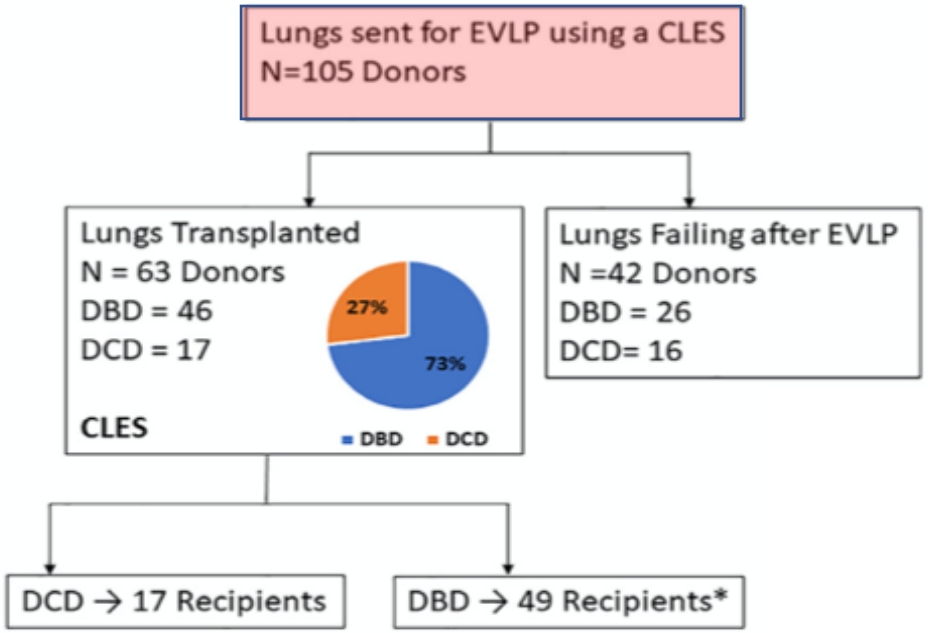

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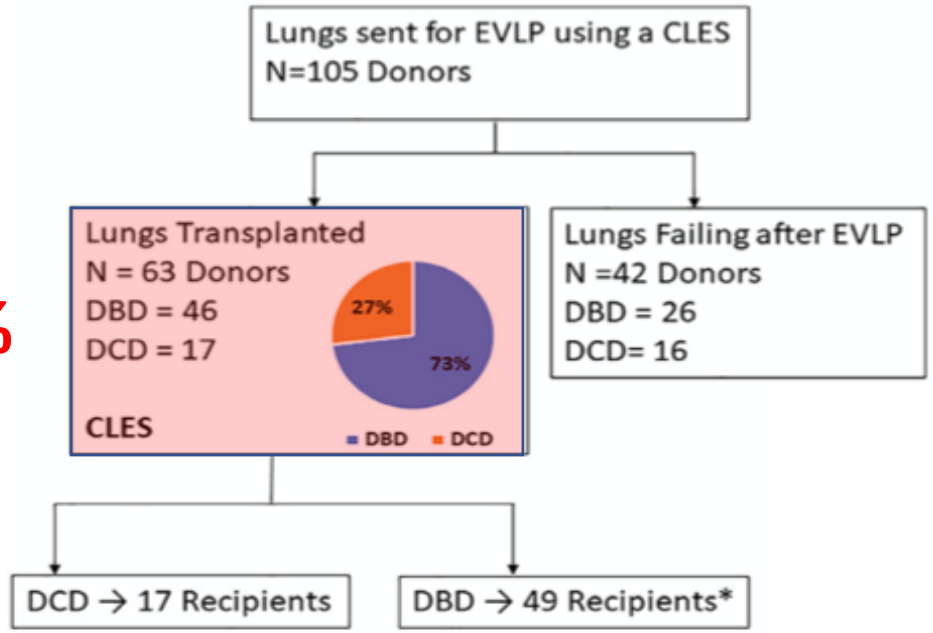
60%



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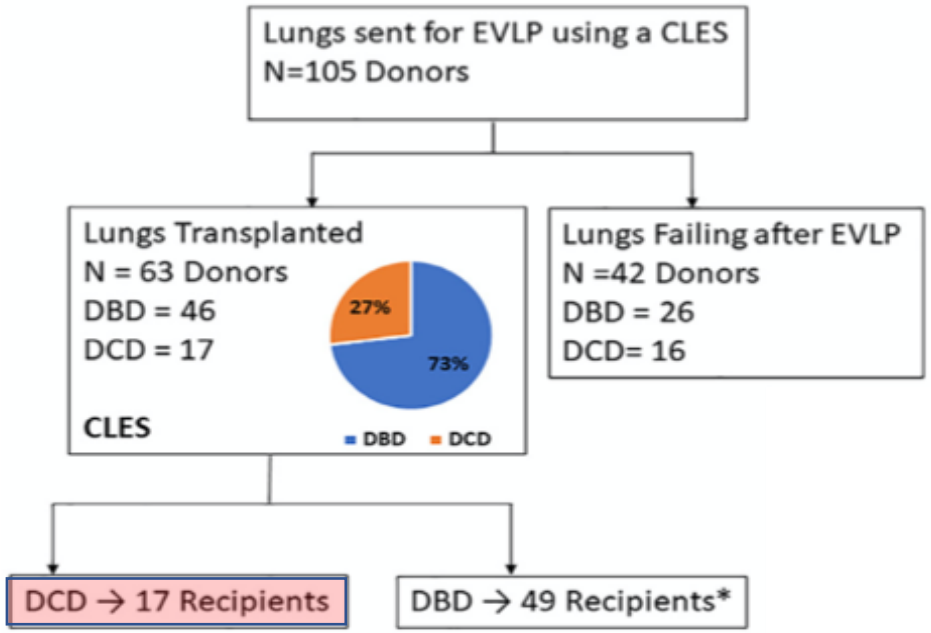

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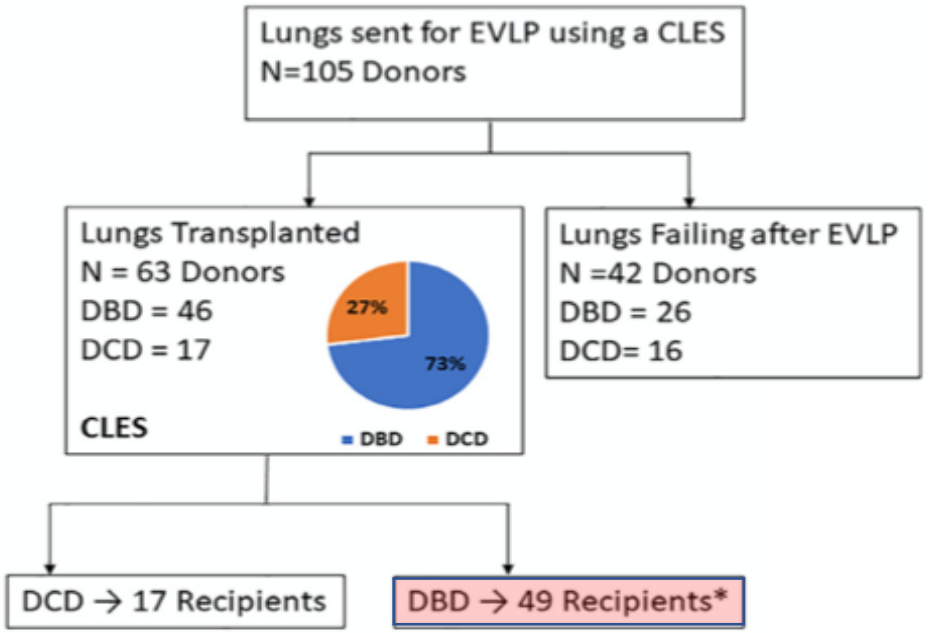

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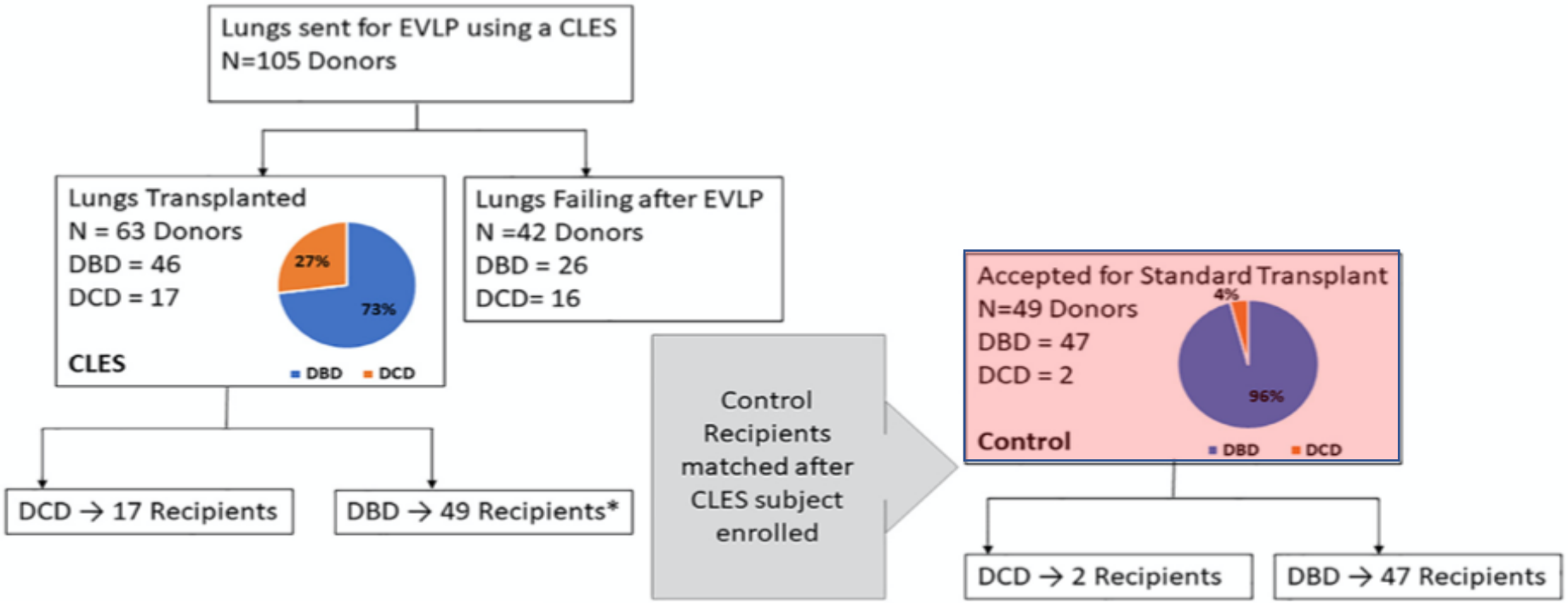

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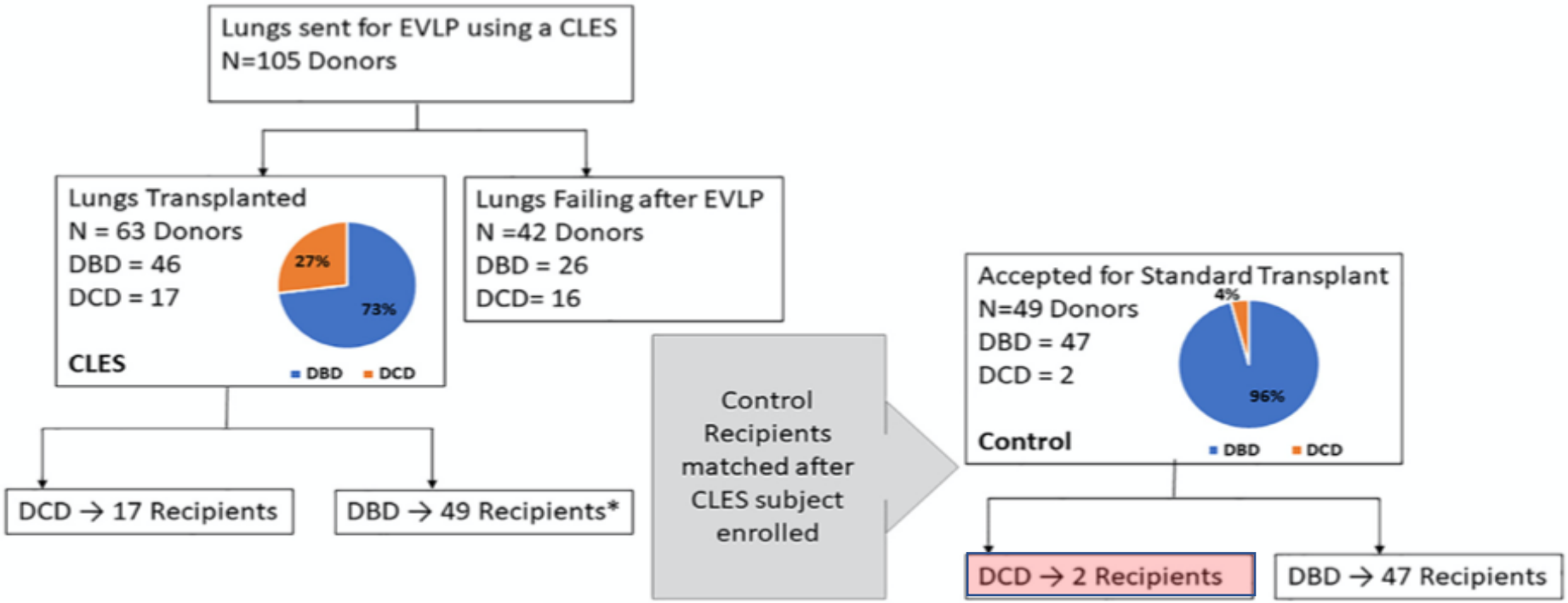

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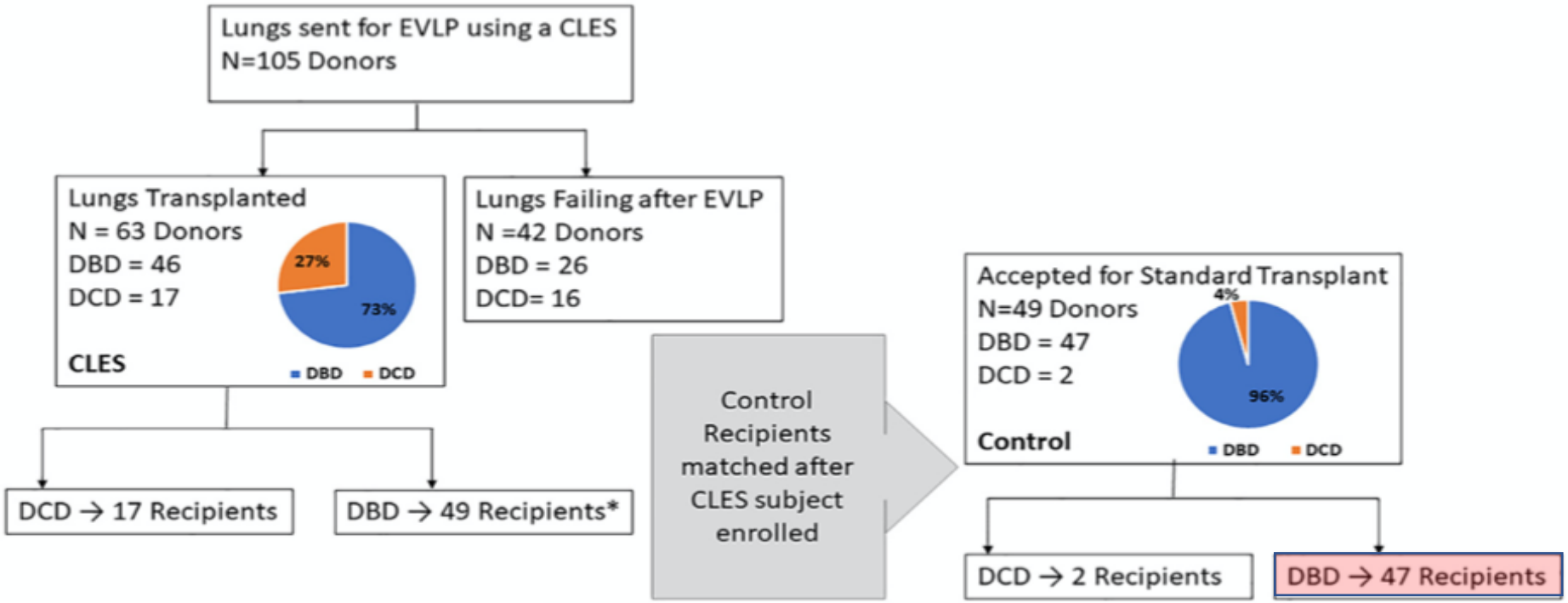

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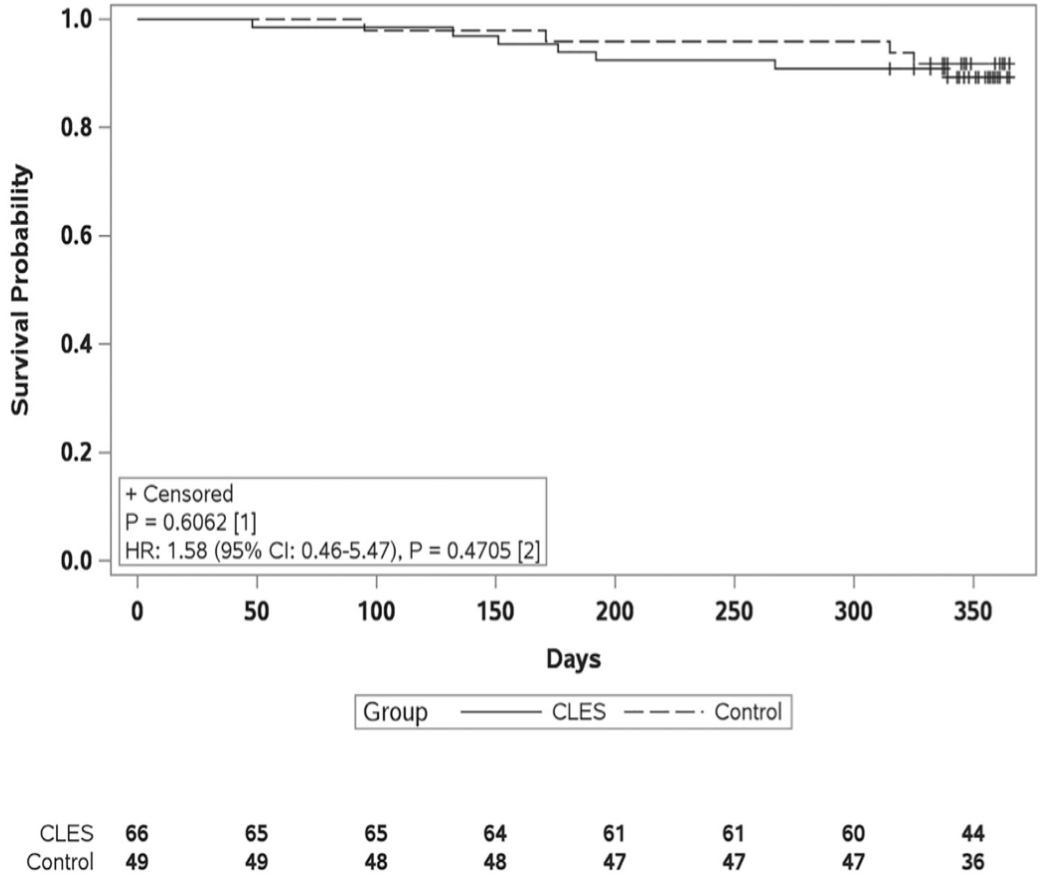

Recipients of allografts assessed with a CLES had a higher rate of PGD3-72 hours.

but similar 30-day and 1-year outcomes compared to conventional lung recipients.

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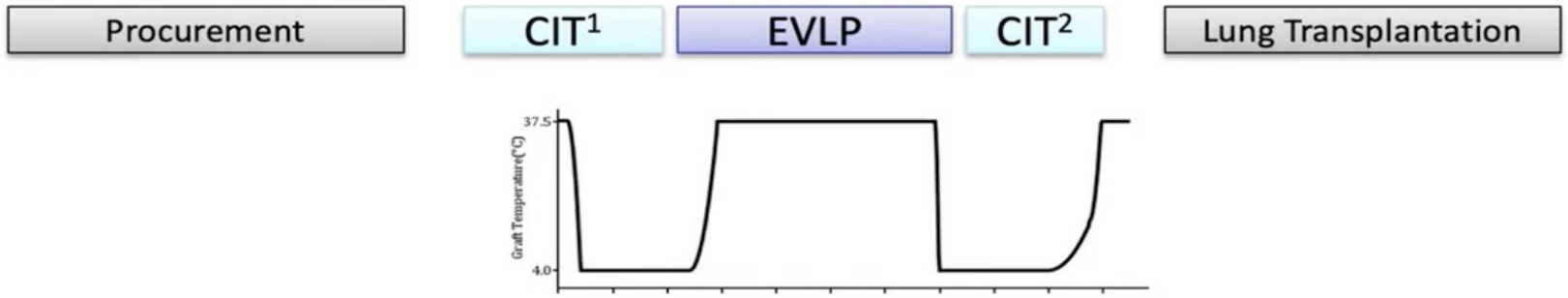
How about ischemic time ?

Extended Preservation Time with Ex Vivo Lung Perfusion



- Normothermic EVLP allows for prolonged Total Preservation Time (TPT)
- Includes TWO periods of protective Cold Ischemic Times (CIT1 and CIT2)

Determining the impact of ex-vivo lung perfusion on hospital costs for lung transplantation: a retrospective cohort study

Short Title: Phase-specific hospital costs for EVLP

Peel JK[1,2,3], Keshavjee S[2,4,5], Naimark D[3,6], Liu M[2,4,5], Del Sorbo L[2,5,7], Cypel M[2,4,5], Barrett K[3,7], *Pullenayegum EM[3,8], *Sander B[3,5,9,10]

Total phase-specific costs were similar across each phase of care.

Cumulative costs at five-years since referral :

In the pre- EVLP era : $278,777 ($82,575–$298,135)

In the modern era : $293,680 ($252,832–$317,599)

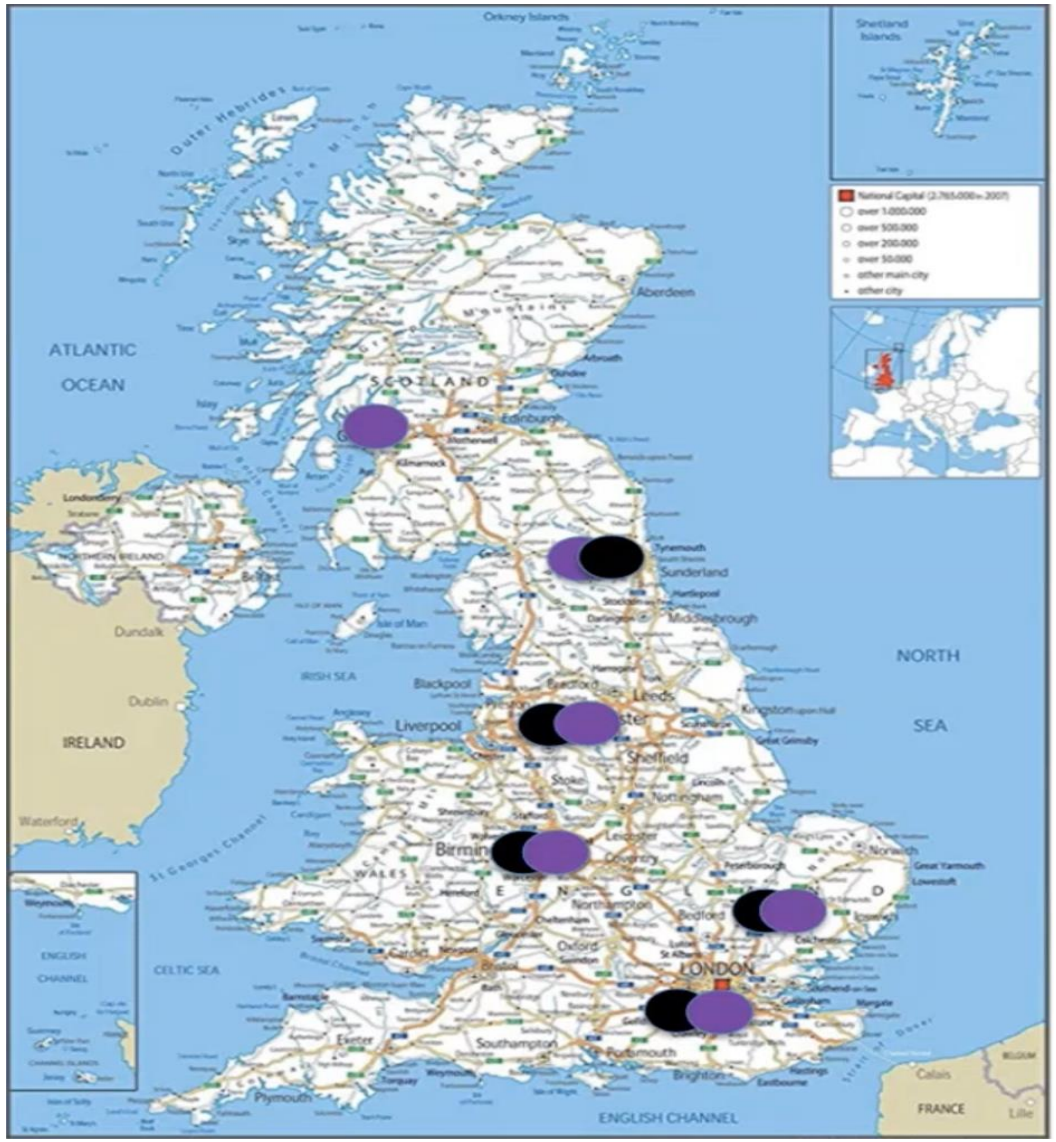
The absolute difference between means was $14,903, reflecting an approximate 5% relative increase

You do it for yourself and the others

Concept of one for all and all for one

- Future/present of transplantation
- Established in heart DCD OCS
- North America : Canada , USA
- Expend expertise
- Rationalize resources
- Increase transplantation

Can we do it in the UK ?



Organ Donation and Transplantation 2030: Meeting the Need

A ten-year vision for organ donation and transplantation in the United Kingdom

Objectives

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- Increase lung transplantation with focus on marginal donors by reducing the number of declined organs

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- Use of Ex Vivo Lung Perfusion (XPS)

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- National joint protocol

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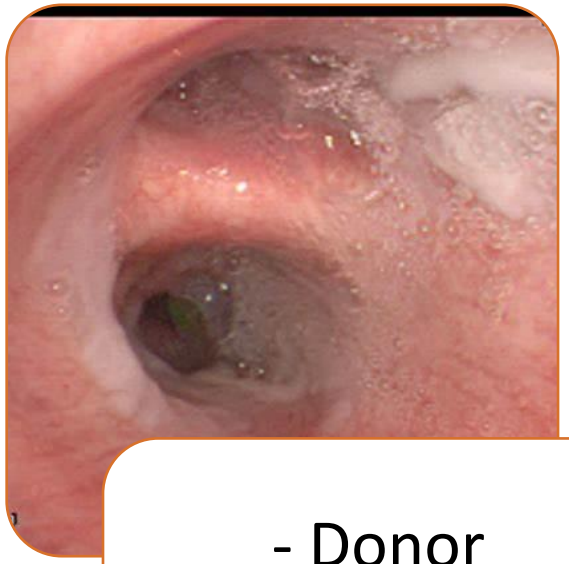
- Increase lung transplantation with focus on marginal donors by reducing the number of declined organs
- Use of Ex Vivo Lung Perfusion
- National joint protocol
- One center serving all lung transplant units

UK ARC proposal

UK ARC proposal

Retrieval team: NORS team



- Donor assessment
- Confirm EVLP criteria with implant centre

UK ARC proposal

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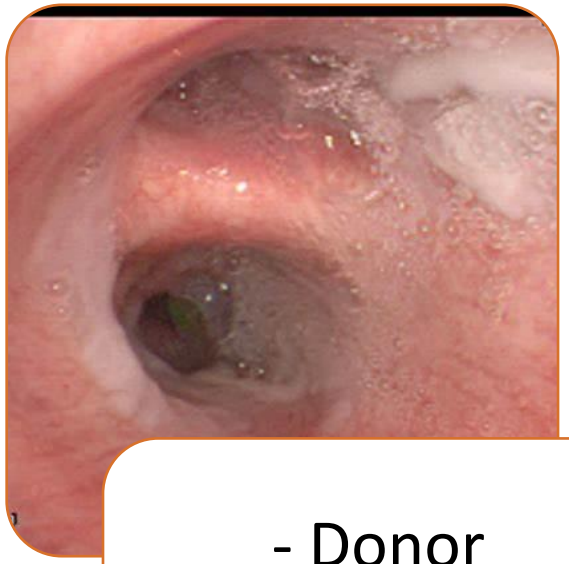

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Recovery Centre

- Receiving lungs
- EVLP run
- Sharing live communication
- Sending lungs to implanting centre

UK ARC proposal

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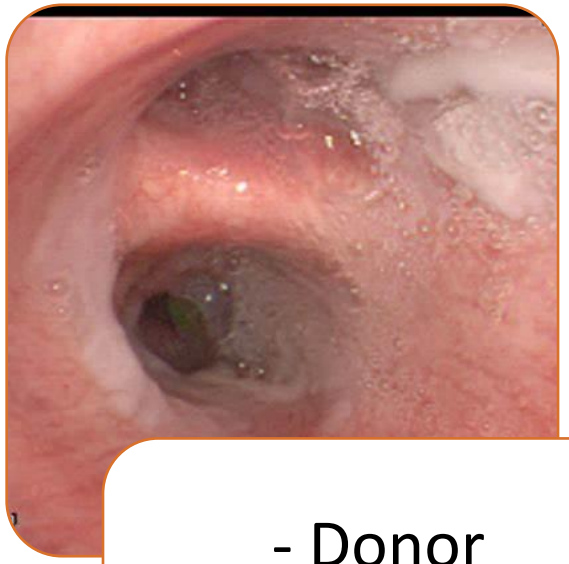

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Transplant Centre

Decision making on transplantability

Process of ARC

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- **NO change in allocation system**

Process of ARC

- NO change in allocation system
- **NO change in NORS rota or competencies**

Process of ARC

- NO change in allocation system
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- **Pilot multi-centre feasibility study**

Process of ARC

- NO change in allocation system
- NO change in NORS rota or competencies
- Pilot multi-centre feasibility study
- **The goal is to have a UK nation wide Lung ARC program, having all transplant centres access to a sustainable EVLP program based on dedicated hub.**

The two steps of ARC

Step 1 :

- Three-year national pilot ARC (one location) which will perform EVLP for all recipient centres .

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Step 2 :

- Pending outcomes and funding, the establishment of a second lung ARC to serve the north and south (Northern and Southern ARC) is considered.

Chances of ARC success in the UK

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- Small country

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- NORS system for organ retrieval

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- Successful DCD heart national program
- Potential to increase donor utilization : Target DCD +/NRP (20-40%)

Conclusion

- **Golden opportunity**
- **Solution for the crisis**
- **Protocol established**
- **Agreement in place**
- **The success is linked to a vision of a national collaboration and dedication in spreading the expertise to all retrieval and transplant teams**


SELFLESS ACT THAT CAN SAVE THE LIVES OF MANY PEOPLE
THIS DISPLAY IS DEDICATED TO ALL THOSE WHO HAVE GIVEN THIS MOST SPECIAL GIFT