Critical Care Physical Therapy for the Lung Transplant Patient

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Objectives

1. To understand the role of physical therapy services in the context of a lung transplant patient population
2. To understand the Lung CAS Score allocation system
3. To educate on key physical therapy assessment components in both the pre and post-lung transplant phases of patient hospitalization

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Objectives

4. To understand the interdisciplinary model of patient care in the context of lung transplantation
5. To determine the risk factors for ICU-Acquired Weakness and best practices to prevent debility
6. To assess patient case study scenarios regarding lung transplant and the role of physical therapy

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Overview
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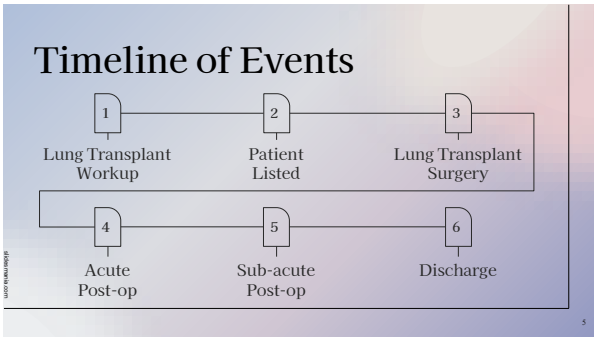
Timeline of Events
1
Lung Transplant Workup
2
Patient Listed
3
Lung Transplant Surgery
4
Acute Post-op
5
Sub-acute Post-op
6
Discharge
5


01
Lung Transplant Workup
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PT Assessment

PLOF

- Level of independence
- Functional changes
- History of falls

DME

- Adaptive equipment
- Oxygen needs

Home Environment

- Stairs and other barriers
- Location
- Caregiver support

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PT Assessment

Current Function

- **Assistance needs**
- MMTs
- Endurance
- Diaphragm activation

Outcome Measures

- **6-MWT**
- Grip Strength
- AM-PAC
- PERME
- MBI

Plan of Care

- Team collaboration
- Family involvement
- OOB Mobility
- Walking program

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Lung CAS Score

Scored out of 100

- Lung Composite Allocation Score
- National Database
- Allocation based 20 factors
  - Varying weights assigned
  - Physical Therapy specific factors
    - Functional status
    - 6-MWT distance
- Prior system: LAS

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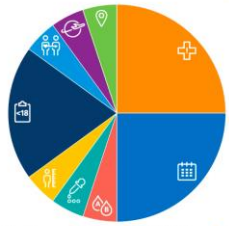
Factors that make up the lung CAS



- candidate medical urgency
- likely survival > five years
- blood type match
- immune system matching (CPRA)
- height match
- listed younger than 18
- prior living donor
- travel efficiency
- proximity efficiency

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

Date of birth: *

Date added to the waiting list: *

Height: *
ft in
cm

Weight: *
lbs
kg

Blood type: *

Prior living donor: *
Yes No

Lung diagnosis code *

Detailed CPRA: *
CPRA Calculator

Functional status:

Assisted ventilation:

Requires supplemental O_2 at rest:

Pulmonary artery systolic pressure:
mmHg

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Lung diagnosis code *

Detailed CPRA: *
CPRA Calculator

Functional status:

Assisted ventilation:

Requires supplemental O_2 at rest:

Pulmonary artery systolic pressure:
mmHg

Blood type: *

Prior living donor: *
Yes No

Lung diagnosis code *

Detailed CPRA: *
CPRA Calculator

Functional status:

Assisted ventilation:

Requires supplemental O_2 at rest:

Pulmonary artery systolic pressure:
mmHg

Mean pulmonary artery pressure:
mmHg

Cardiac index (CI):
L/min/m²

6-minute walk distance:
feet

Total bilirubin:
mg/dL

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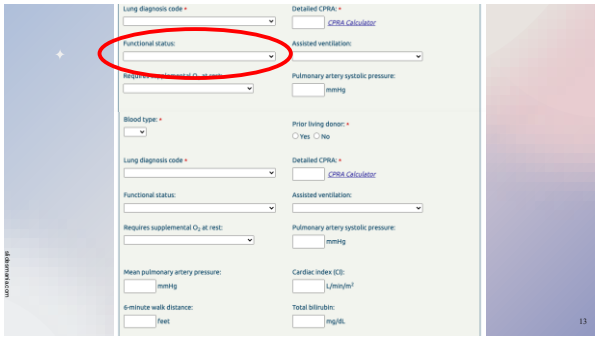
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CPRA Calculator
Functional status:
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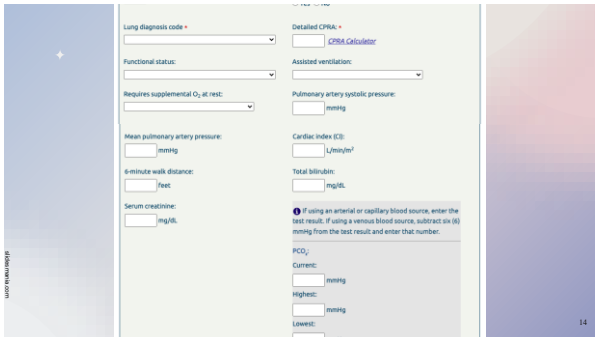
Functional status:
Assisted ventilation:
Requires supplemental O_2 at rest:
Pulmonary artery systolic pressure:
mmHg
Mean pulmonary artery pressure:
mmHg
Cardiac index (CI):
L/min/m²
6-minute walk distance:
feet
Total bilirubin:
mg/dL
13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CPRA Calculator
Functional status:
Assisted ventilation:
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Pulmonary artery systolic pressure:
mmHg
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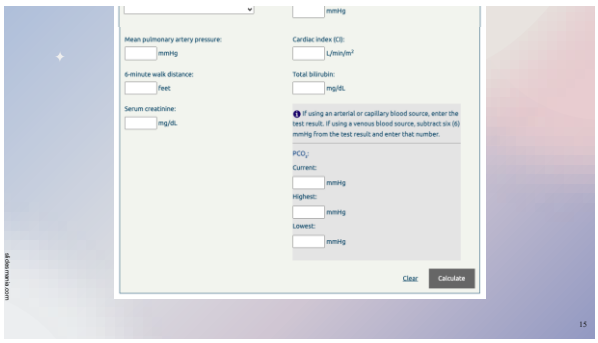
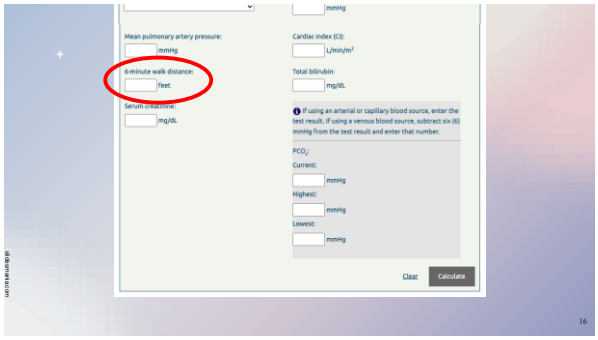
Cardiac index (CI):
L/min/m²
6-minute walk distance:
feet
Total bilirubin:
mg/dL
Serum creatinine:
mg/dL
If using an arterial or capillary blood source, enter the test result. If using a venous blood source, subtract six (6) mmHg from the test result and enter that number.
PCO_2:
Current:
mmHg
Highest:
mmHg
Lowest:
14


mmHg
Mean pulmonary artery pressure:
mmHg
Cardiac index (CI):
L/min/m²
6-minute walk distance:
feet
Total bilirubin:
mg/dL
Serum creatinine:
mg/dL
If using an arterial or capillary blood source, enter the test result. If using a venous blood source, subtract six (6) mmHg from the test result and enter that number.
PCO_2:
Current:
mmHg
Highest:
mmHg
Lowest:
mmHg
Clear
Calculate
15



Lung Transplant Workup

- Role of Physical Therapy
  - Gather data during initial evaluation and subsequent treatment sessions
  - Communicate with Lung Transplant team
  - Set patient and caregiver expectations
  - Collaborate with interdisciplinary team for patient mobility
  - Maximize patient function

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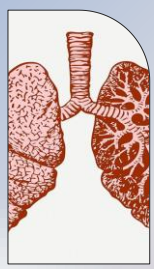

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Patient Listed

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Role of Physical Therapy

- Establish daily mobility goals based on current level of function
  - OOBTC
    - Level of assistance needed
      - Total A requires use of mechanical lift and sling
      - Max A requires skilled PT assistance vs. RN use of mechanical lift and sling
      - Mod A requires skilled PT assistance vs. x2 RN assistance
      - Min A requires RN assistance
      - CGA/SPV requires RN assistance vs. PCT assistance vs. family assistance
      - IND requires patient to notify RN when mobilizing
  - Walking program
    - 1-mile per day
- Coordinate with team
  - Set clear expectations

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Acute Decompensation

- Patient now requiring increased level of intensive care
  - Supplemental oxygen
  - Mechanical Circulatory support devices
  - ECMO Support
- ***Immobility leads to increased mortality***
- ICU-Acquired Weakness
  - Profound changes within muscle fiber function and nerve conduction
    - Implications for mobility
    - Implications for strength of respiratory muscles
      - Diaphragm
    - Can lead to adverse outcomes

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ICU-Acquired Weakness

- A neuromuscular complication with resultant skeletal muscle dysfunction
  - Increased risk in patients with
    - Prolonged immobility
    - Sepsis
    - Hyperglycemia
    - Use of glucocorticoids
  - Can lead to
    - Delayed extubation
    - Increased length of stay
    - Poor prognosis
    - Decreased quality of life

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ICU-Acquired Weakness

In the context of pre-transplant

Scenario 1:
- Significant changes to functional mobility
  - OOB
  - Ambulation
  - Diaphragm activation
- Patient remains bedbound
- Patient no longer a candidate to receive transplant
- Change in listed status
- Death

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ICU-Acquired Weakness

In the context of pre-transplant

Scenario 2:
- Significant changes to functional mobility
  - OOB
  - Ambulation
  - Diaphragm activation
- Mobility prioritized by the medical team
- Seen daily by physical therapy
- Patient remains a candidate for lung transplantation and remains listed
- Patient successfully undergoes lung transplantation

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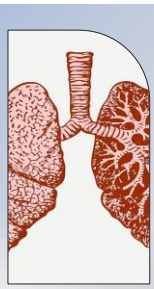

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Lung Transplant Surgery

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Role of PT

- Transplant team communication
  - CICU bedside RN
  - Nurse practitioner
  - Surgeon
  - Respiratory therapist
  - Occupational therapist
- Family member support

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Acute Post-op

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Timeline of Events

1. Chest open for ~24 hrs
2. Return to CVOR for closure
3. Wean sedation
4. Extubate
5. PT reassessment within 1-hour
6. Ambulate >250 ft.

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PT Reassessment Post-op

Lab values

- Hgb & Hct
- Lactic Acid
- ABGs
- Albumin

Lines & Tubes

- Supplemental Oxygen
  - iNO
- Art-Line
- Drips
  - Vasopressors
  - Sedatives
- ECMO vs. none

Team Coordination

- Bedside RN
- Nurse Practitioner
- Respiratory Therapist
- Occupational Therapist
- ECMO RN

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Team Coordination

Bedside RN

- Hemodynamic monitoring
- Management of lines/tubes

Respiratory Therapist

- Management of supplemental oxygen, iNO
- Monitor patient respiratory status

Nurse Practitioner

- Titration of medications
- Overall patient assessment

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Team Coordination

Occupational Therapist

- Co-treat session
- Functional assessment

ECMO RN

- Line/tube management
- ECMO management of flow, sweep

Family Members

- Involve as much as possible/as appropriate
- Engage and explain

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Post-op Ambulation

- Goal is to ambulate > 250 ft. in the first hour after extubation
  - Progressive mobilization
    - Supine > long sitting > edge of bed > standing > ambulation
    - Safety checks at each change in position
      - Hemodynamics
      - Patient comfort
      - Ability to follow commands
      - Multiple skilled providers assisting
        - All medical team aware of their role during patient mobility
      - Use of EVA Walker
      - Chair follow
      - AmBu Bag

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Post-op Ambulation

- Benefits include
  - Improved strength and endurance
  - Decreased risk of developing ICU-Acquired weakness
  - Increased secretion clearance
  - Improved breathing pattern
  - Improved hemodynamic stability
  - Decreased LOS
  - Preventions of blood clots
  - Set patient and family member expectations

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ICU-Acquired Weakness

In the context of post-transplant

Scenario 1:

- Patient remains in bed for days after transplant
  - Hemodynamic instability
  - Fear of mobility
  - Patient and family buy-in
  - Increased length of supplemental oxygen requirements
  - Increased ICU stay
  - Increased overall hospital length of stay

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ICU-Acquired Weakness

In the context of post-transplant

Scenario 2:
- Immediate PT engagement post-op with OOB mobility encouraged within the first few hours of extubation
  - Increased activation of diaphragm
  - Decreased risk of clots
- Patient remains a candidate for lung transplantation and remains listed
- Seen daily by physical therapy
- Mobility prioritized by the medical team
- Patient successfully undergoes lung transplantation

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Sub-Acute Post-op

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Patient Plan of Care

- Variable based on patient function and line/tube burden
- If patient is requiring significant assistance to mobilize
  - PT will plan to see daily or twice daily
- If patient is able to ambulate with supervision
  - Recommend mobility with RN and use of EVA Walker
- Regular re-evaluations every two weeks
- Open communication with team
  - Can always revise POC and frequency of visits with change in functional status
- Set clear expectations

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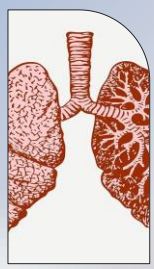

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Discharge

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Discharge

- Inpatient rehab vs. home vs. local housing
  - Dependent on patient function
  - Dependent on home environment and distance from hospital
- Caregiver support
  - Education
- DME Needs
- Home exercise program
- Continue with walking program once discharged

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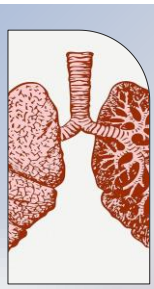

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Scenarios

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Ms. Jones is a 19-year old female with a history of cystic fibrosis. Her oxygen requirements have recently increased, prompting hospitalization. She has been followed by the lung transplant team for years and is now nearing a stage in which transplant is necessary.

- What information do you need to gather upon initial assessment?
- What is your expectation of this patient's functional ability?
- What safe mobility goals would you anticipate to be appropriate for this patient?

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Mr. Smith is a 54-year old male with interstitial lung disease. He has typically required 2-4 L O2 NC at home but now requires 8L O2 at rest and up to 25L O2 during activity. He is undergoing workup for lung transplant listing. Mr. Smith utilizes a cane and a prosthetic leg due to past history of MVA with subsequent RLE BKA back in 2002.

- What information do you need to gather upon initial assessment?
- What is your expectation for this patient's functional ability?
- What staff members would you anticipate coordinating with for the care of this patient?

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Mr. Williams is a 61-year old male with history of COPD and COVID-19 who underwent Bilateral Lung Transplantation 10 days ago. He was initially extubated post-op but quickly required re-intubation and cannulation for VV ECMO (bifemoral approach) due to decompensation. He now presents on vent via trach and is A&O x2. Family members are at bedside.

- What information do you need to gather upon initial assessment?
- What is your expectation of this patient's functional ability?
- What safe mobility goals would you anticipate to be appropriate for this patient?

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Mrs. Miller is a 63-year old female with history of ILD. She underwent successfully BLTx 2 days ago and is currently in the CICU. Her sedation has been weaned and the medical team is preparing to extubate. Mrs. Miller led an independent lifestyle prior to transplant and has been highly motivated throughout her pre-transplant hospitalization. She was participating in a daily walking program of 20 laps/day without requiring assistance.

- What information is important to determine during re-evaluation?
- What is your expectation of this patient's functional ability?
- What is the flow of events for safe mobility of this patient?

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Resources

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Resources

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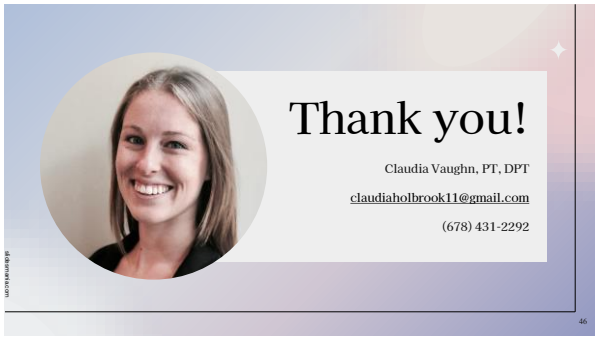
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