Improving the Quality of Exercise Prescription for Patients Readmitted Within 18 months After Lung Transplant

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Background

- The Hospital of the University of Pennsylvania (HUP)
- High-volume lung transplant program
- Needs assessment:
  - Number of inpatients readmitted after lung transplant trending up
  - Longer lengths of stay than average
  - Often functionally independent, but have other activity limitations
  - What is the best exercise prescription?
The benefits of pulmonary rehab before and immediately after lung transplant are well-established.

What about after outpatient pulmonary rehab?

Medical advancements → longer life expectancy → more readmissions

Acute readmission = great opportunity for PT to:

1. assess function
2. prescribe an optimal exercise prescription
Study Design

- April – July 2015 (4 months)

<table>
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<tr>
<th>Inclusion Criteria</th>
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<tr>
<td>Single/bilateral lung transplant</td>
<td>LOS ≤4 days (n=2)</td>
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<td>Transplant done at HUP</td>
<td>Did not complete all functional tests prior to discharge (n=2)</td>
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<td>6-18 months post transplant</td>
<td>Weight bearing or activity limitations (n=1)</td>
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<td>Inpatient on a single floor</td>
<td>Deceased prior to discharge (n=1)</td>
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Innovative Considerations

- Quality or Process Improvement:
  - Measure outcomes after implementation of a change

- Comparative Effectiveness:
  - Compare different treatment protocols and analyze relative benefits/harm
  - Determine the BEST treatment protocol
  - Emerging field in public health
Changing Practice

**Old:** Low frequency (~weekly or biweekly)
Primarily floor-based, encouraged independent exercise program

**New:** Increased frequency (goal 3x/week)
Proximal muscle strengthening
Gym-based treadmill training

**Measure outcome(s):**
Six Minute Walk Test (6MWT)
Participant Demographics

- N = 6 patients (3 ♂, 3 ♀)
- 11 admissions (5 readmitted x2)
- Age range: 53-70 years old
- Median days since transplant: 371 days
- Median length of stay (LOS): 9 days

**Single lung transplant (n=4)**
- Idiopathic pulmonary fibrosis (n=3)
- COPD (n=1)

**Bilateral lung transplant (n=2)**
- Severe hypersensitivity pneumonitis (n=1)
- Idiopathic pulmonary fibrosis (n=1)
How representative was our sample?

Reasons for Readmission
- Respiratory tract infections (6)
- Pleural effusions (2)
- Severe sepsis from a respiratory source (1)
- Skin infection (1)
- Dehydration (1)

Our Study (n=11)
Vigneswaran et al, 2010 (n=221)
A Functional Snapshot

1. Balance/Falls Risk
2. Frailty
3. Skeletal Muscle Strength
4. Health-related Quality of Life
Falls Risk

One documented inpatient fall (Patient 2, BBS = 51, +history of falls)

Increased falls risk if:
1) History of falls and BBS ≤ 51
2) No history of falls and BBS ≤ 42

• Median = 51/56
Frailty Measure – Grip Strength (dominant hand)

- Well-established link between pre-transplant frailty and worse post-transplant outcomes
- Median = 23.1 kg

Grip Strength (kg)

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<thead>
<tr>
<th>Patient 1</th>
<th>Patient 2</th>
<th>Patient 3</th>
<th>Patient 4</th>
<th>Patient 5</th>
<th>Patient 6</th>
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<tbody>
<tr>
<td>23.4</td>
<td>16.2</td>
<td>27.2</td>
<td>17.5</td>
<td>23.4</td>
<td>22.6</td>
</tr>
<tr>
<td>22.2</td>
<td></td>
<td>27.8</td>
<td>17.8</td>
<td>23.5</td>
<td>23.1</td>
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Normative Values
- Men 60-69 yo (R hand) = 40 kg
- Women 60-69 yo (R hand) = 38 kg
Strength – Manual Muscle Testing

- All patients had **proximal bilateral lower extremity muscle weakness** (3-4/5 MMT)
- Consistent with the literature\(^3\)
  - Effects of immunosuppressants \(\rightarrow\) skeletal muscle myopathy
  - Deconditioning/microgravity
St. George Respiratory Questionnaire - Domains of Health-Related Quality of Life

Symptoms: 68.53
Activities: 79.67
Impact: 45.12
Total: 57.05

Median of Patient Scores
Median increase = 32 m (23%) (p<0.01)

- **a** = Last 6MWT, outpatient pulmonary rehab
- **b** = admission 6MWT
- **c** = discharge 6MWT
Submaximal Aerobic Capacity (6MWT)

Patient 2

Distance Walked (meters)

58 yo female, bilateral lung transplant for severe hypersensitivity pneumonitis
- Recurrent bronchial narrowing
- LOS = 99 days

Exercise program: initially floor-based, then → gym, treadmill 2-3 times/week

Increase = 67 m (31%)
Feasibility of Practice Change - Challenges

- Frequently inappropriate for gym exercise
  - Droplet precautions
  - Supplemental O₂ requirements too high
  - Chest tube to suction
- Resource-intensive
  - Transport to/from the gym
  - Therapist time
  - Gym/treadmill availability
- Busy environment
  - Unpredictability of acute care
  - Hard to find an uncrowded space for 6MWT
- Patient engagement
  - Perception: hospital admission is “a break” from exercise
  - Variable symptomatic tolerance
Feasibility of Practice Change - Successes

- Median improvement in distance walked = 32 m (23%) (p<0.01)
- Frequency increased to 2.4 sessions/week
- Used available equipment optimally
- All patients were admitted from home, discharged to home (except 1 → SNF for IV drug delivery only)
- Increased overall patient participation in structured exercise programs
References


