Rehabilitation of a 69 year-old s/p BOLT Procedure: Using RPE to measure Exercise Intensity

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Introduction

There are over 2,000 lung transplants performed yearly for patients with end stage pulmonary diseases. (Valapour et al, 2024). Since COVID, the number of patients presenting to inpatient rehab following lung transplantation has grown (Goodman et al, 2024). Previous research indicates that the use of HIIT aerobic exercise has shown improvements in outcomes for this patient population(Wickerson et al, 2016). However, research has not been performed using alternative methods to track intensity(RPE).

Purpose: Determine the effectiveness of using patient reported high intensity aerobic endurance and functional mobility training with the use of RPE to track intensity during training for a patient s/p BOLT procedure with complicated hospital course.

Research Question: Is the use of RPE an effective method to track intensity in patients s/p BOLT procedure to improve functional outcomes in an inpatient rehabilitation setting?

Case Description

Participant: and Hx. Present Condition:

- The patient is a 68 y/o patient s/p BOLT procedure for end stage pulmonary disease with PMH significant for asbestos exposure, Chronic respiratory failure on 2L O2 @ home, pulmonary fibrosis(2023), and T2DM.

Evaluation Findings and POC:

- Original POC(Jan 17,2025): 3 weeks for 120 mins per day 5-6 days per week to address BLE functional weakness, Decreased functional mobility, decreased endurance, decreased cardio/pulm endurance and strength, increased fall risk
  - Altered to chronic level 60 min per day 5-6 days per week at 2 weeks due to chronic level with readmission to hospital for worsening condition and post surgical illness
- Altered POC(March 4, 2025) 4 weeks for 60 mins per day 5-6 days per week to address above impairments with the addition of decreased cough productivity and effectiveness

Interventions

Main Interventions:

- Progressive Intensity Aerobic Interval Training
  - Goal of 7/10 Modified Borg RPE
  - Paired with active recovery until at 4/10 RPE
- Pulmonary Muscle and Cough Facilitation Training
  - Pursed lip, active cycle, and diaphragmatic breathing
  - 3x10 initially, then used for active recovery

Aerobic Interval Training Progressions

Initial Interventions	Progression 1	Progression 2	Progression 3	Progression 4	Progression 5
• Bed mobility and Endurance/ positioning in bed based on RPE • Sitting upright with HOB elevated • Supine active recovery during rest phase supine with HOB elevated (Wickerson et al, 2016).	• EOB and Seated Endurance and positioning in W/C • 2-3x, 1-5 minutes back unsupported during session(based on RPE) • 1-3 hours between sessions • Seated active recovery during rest phase	• Standing Endurance • 3-5x5 reps, 1-2 minutes and sit to stands in parallel bars and with RW (based on RPE) • Seated active recovery during rest phase	• Standing marches • 2-3x10 reps BLE in parallel bars and with RW(based on RPE) • Alternating 2 steps forward and backward 2-3x10 (based on RPE) • Seated active recovery during rest phase	• Ambulation 2-3x 100 feet with W/C follow (based on RPE) • Ambulation 2-3x 100 feet without W/C follow(based on RPE) • Seated active recovery during rest phase	• Higher level functional mobility and aerobic training • Stairs- 2-3x4 ascending and descending stairs w/ bilateral railings(based on RPE) • Stairs- 2-3x4 ascending and descending stairs w/ unilateral railing(based on RPE) • Ambulation 3x>100 feet with 1x10 standing marches BLE before sitting • Seated active recovery during rest phase

Outcome Measures

TUG	Trial 1	Trial 2	Trial 3	TUG AVG
1/17/25 Initial Eval	49.9 sec	42.7 sec	38.2 sec	43.6 sec
3/25/25 Expected D/C	19.3 sec	14.5 sec	14.6 sec	16.1 sec

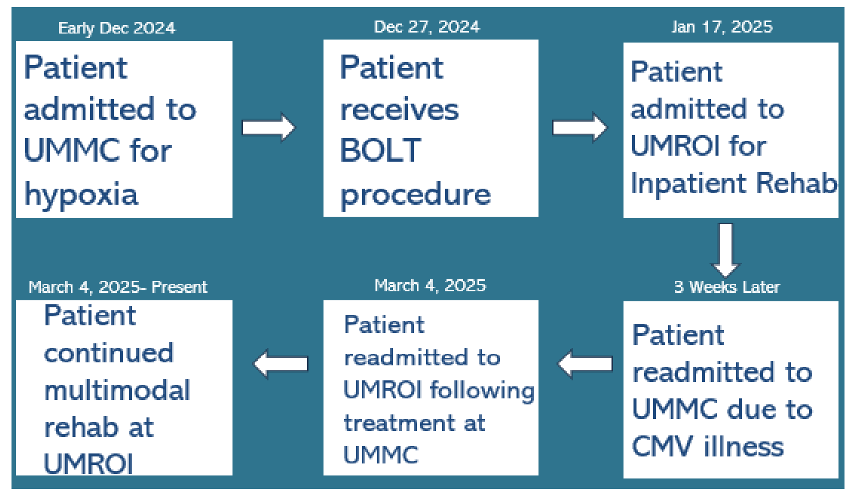
MMT 1/17/25	R	L
Hip Flexors	5/5	4+/5
Hip Ext	1+/5, at least	1+/5, at least
Hip ABD	2+/5, at least	2/5 at least
Knee Ext	5/5	5/5
Knee Flexors	4/5	2+/5, at least
DF	5/5	5/5

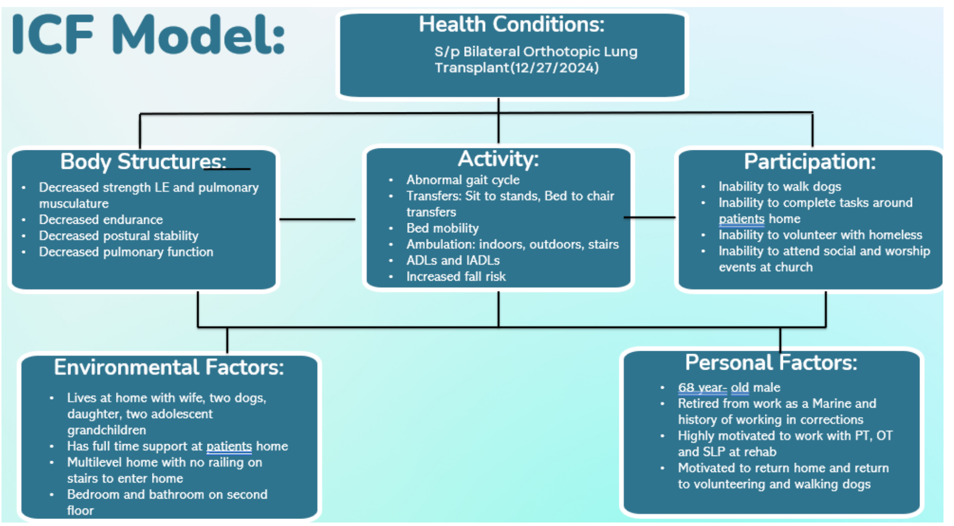
MMT 3/25/25	R	L
Hip Flexors	4/5	5/5
Hip Ext	3+/5	3/5
Hip ABD	4/5	3+/5
Knee Ext	5/5	5/5
Knee Flexors	5/5	5/5
DF	5/5	5/5

IRF PAI	Rolling R and L	Sit to Lying/Lying to Sitting	Sit to Stand	Chair/bed-to-chair transfer	Ambulation to 4 Stairs
IRF PAI 1/17/25 and 3/4/2025	88-Not attempted due to medical or safety	88-Not attempted due to medical or safety	88-Not attempted due to medical or safety	88-Not attempted due to medical or safety	88-Not attempted due to medical or safety
IRF PAI 3/25/25	88-Not attempted due to medical or safety	88-Not attempted due to medical or safety	04- Supervision/Touching Assistance	04- Supervision/Touching Assistance	04- Supervision/Touching Assistance

Code 88- Not attempted due to medical or safety used if transferring from elevated HOB, pts head elevated due to aspiration precautions

ICF Model and Timeline





Results and Discussion

Results and Discussion: Patients TUG time decreased by over ½ to decrease risk of falling compared to frail elderly adult population norms(Shirley Ryan Ability Lab, n.d). Patient improved MMT for Hip. Extension and Hip Abduction on BLE to improve functional strength. Patient improved out of bed functional mobility status assist levels to allow for better community access. Patient established baseline measurements for 6MWT, 5x STS, and 10 Meter Walk Test value outcome measurements. **Limitations:** Due to complex nature of inpatient rehab and this condition, patients rehospitalization did not allow for time to amply assess many outcome measures at more then 1 time point. TUG norms have not been assessed for this population so comparisons were made to similar population for outcomes. **Further Research:** Using RPE parameters to track intensity of exercise during HIIT aerobic training with pulmonary interventions with a larger sample size of patients s/p BOLT procedure.

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