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Physical Therapy Goals and Exercise Participation during Fast-Track Inpatient Rehabilitation Following Lung Transplantation: A Program Evaluation

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Abstract

Purpose: To improve physical functioning and a timely home discharge, a higher intensity, shorter duration rehabilitation protocol was developed for people requiring fast-track inpatient rehabilitation following lung transplantation (LTx). The study aimed to evaluate exercise participation, physical therapy goals, and functional outcomes before and after the protocol change. **Materials and Methods:** A single-center, retrospective program evaluation of LTx recipients referred to fast-track inpatient rehabilitation from acute care was conducted between June 2022 and June 2024. **Results:** 33 LTx recipients were included (58% male, 67 (±8) years). 13 people underwent the traditional protocol and 20 people participated in the new protocol (median length of stay 15 [7] vs 7 [2] days, respectively, p = 0.0001). There was no between-group difference in the change in walking distance from Day 1 to Day 6 of inpatient rehabilitation (P = 0.058). People in the new protocol set more independent exercise fitness-focused goals compared with more foundational functional goals set in the traditional protocol. There was a lack of fidelity in the documentation of rehabilitation participation, exercise biometrics, and goal setting. **Conclusions:** The new rehabilitation protocol achieved similar walking distances in a shorter time. Future directions include standardizing documentation and goal setting to improve data comprehensiveness to optimize this new protocol.

Keywords

Lung Transplantation, Physical Therapy, Inpatient Rehabilitation, Exercise

1. Introduction

Lung transplantation (LTx) is a life-saving intervention that increases lifespan, quality of life, and functional capacity for individuals with end-stage lung disease such as chronic obstructive pulmonary disease (COPD) and interstitial lung disease (ILD). [1] Individuals with severe chronic lung disease awaiting LTx have a higher prevalence of frailty (26% - 30%) compared to community-dwelling elderly (5% - 27%), with poor exercise capacity (6-minute walk distance (6MWD) 45% - 55% predicted) and skeletal muscle weakness [2] [3]. Over the last 20 years, the age of people undergoing LTx has risen, particularly for people over 65 years of age (34.3% in 2021 vs. 20.5% in 2010) [1]. Older age is associated with multiple comorbidities and physical frailty, which contribute to decreased functional mobility, an increased hospital length of stay (LOS), and a greater need for inpatient rehabilitation following surgery [1] [4].

Before LTx, outpatient rehabilitation is recommended to improve exercise capacity, muscle strength, and quality of life to improve fitness for surgery [2] [5] [6]. During the hospitalization after LTx, acute care rehabilitation is essential to mitigate the effects of pre-transplant functional limitations, prolonged immobility and post-operative deconditioning, and side effects of immunosuppressive medications including muscle myopathy [7]-[9]. Upon hospital discharge, structured outpatient rehabilitation is recommended to increase aerobic endurance, muscle strength, and flexibility for up to three months post-transplant [2] [10]-[12]. Improved functional outcomes have been reported between the pre-transplant period and up to 6 months post-LTx (6-minute walk distance (6MWD) 45 ± 19 vs. 65% ± 17% predicted, and isometric quadriceps torque 51% vs 59% predicted ($P < 0.05$) [12].

Some LTx recipients may require further rehabilitation prior to safe discharge home from acute care [2] [13]-[15]. There are multiple inpatient rehabilitation streams in Canada ranging between high-intensity rehabilitation, low-intensity rehabilitation, and complex continuing care. The high-intensity rehabilitation stream is targeted for people with an estimated length of stay (LOS) of less than 21 days who can tolerate higher intensity rehabilitation (increased exercise frequency, dose and duration) to improve their functional ability, and has shown improvements in functional exercise capacity, mobility, balance, lower body strength, upper body strength, and independence with activities of daily living [13] [14]. Historically, LTx recipients at our transplant centre who required high-intensity inpatient rehabilitation participated in a 3 - 4-week program and improved their functional exercise capacity, however they experienced ten times the readmission rate to acute care (19%) compared to other inpatient rehabilitation populations [14]. This higher readmission rate emphasized the importance of a population-specific, targeted inpatient rehabilitation to maximize functional exercise capacity prior to home discharge [2] [13] [14].

In 2018, our transplant program created a partnership between the acute transplant site and one of its inpatient rehabilitation facilities to streamline access to

high and low intensity rehabilitation. There was a subset of LTx recipients with greater physical function, higher functional goals, and fewer medical complications who remained in acute care until minor functional barriers to home discharge were resolved. To better meet the rehabilitation needs and improve healthcare system efficiency and resource allocation, a fast-track inpatient rehabilitation stream (a subset of high-intensity rehabilitation) was created for this LTx population that aimed to be higher intensity and shorter duration (7 days). However, people in this fast-track stream continued to follow traditional rehabilitation practices with an average LOS of 21 days. In September 2023, following a quality improvement referral process initiative, a fast-track rehabilitation protocol change was implemented for all new patients, targeting a 7-day LOS. This program evaluation aimed to examine rehabilitation progression, physical therapy goals, and functional outcomes of LTx recipients who underwent fast-track inpatient rehabilitation pre-and post-protocol change, abbreviated as 'traditional' and 'new' protocols respectively.

2. Material and Methods

2.1. Study Design

A single-center, retrospective, longitudinal chart review was conducted at a high volume Canadian LTx centre. Ethics approval was obtained from the University Health Network (UHN) (#24-5423) and the University of Toronto (#47644).

2.2. Medical Criteria for Fast-Track Inpatient Rehabilitation

Inclusion: No medical needs that would limit the ability to discharge into the community within 7 days.

Exclusion: People requiring a video swallow study, require the assistance of two people for mobility, have no confirmed discharge destination, or have acute delirium.

2.3. Participants

Inclusion criteria: 1) Adults who underwent a LTx between June 1, 2022, and May 31, 2024, and 2) underwent the fast-track inpatient rehabilitation stream between June 15, 2022, and June 30, 2024. The new protocol was implemented in September 2023.

Exclusion criteria: 1) LTx recipients who were not referred to fast-track inpatient rehabilitation.

2.4. Data Collection

Digital health records were accessed remotely through the Institution's electronic medical record (Epic™) by two researchers. A chart abstraction tool was developed by the research team (LW and DJ) and piloted on two charts (one traditional protocol and one new protocol).

Demographic and clinical characteristics

Characteristics included pre-LTx diagnosis, 6MWD and pulmonary function,

admission status at time of transplant, wait list urgency, date of transplant, transplant type, acute care and inpatient rehabilitation LOS and three-month post-transplant 6MWD, gait aid use, pulmonary function, and outpatient exercise participation.

Inpatient rehabilitation

Changes to the fast-track rehabilitation protocol:

The new protocol was updated to increase exercise intensity and progression through increasing cycling endurance time, increasing frequency by emphasizing independent walking between physiotherapy sessions, and increasing muscle endurance by increasing the repetitions to 20 prior to increasing the load during strength training. Exercise training was started on the day of admission (Day 0) rather than the next day (Day 1) as was done in the traditional protocol. A physical therapy working group and cross-site visits (between the acute and inpatient rehabilitation facilities) supported the implementation of this protocol.

Functional mobility: This was recorded using standardized categories within the electronic medical record as transfers (level of assistance, gait aid), indoor ground-based ambulation (distance, gait aid, level of independence), stairs (number of steps, level of assistance, step pattern, rails used), and exercise capacity (workload, duration) on a stationary cycle (NuStep™). The level of assistance was categorized as independent, supervision, minimal, moderate, or maximal assistance.

The change in walking distance in meters from Day 1 (initial assessment) to Day 6 was recorded as a change score. These timepoints were used as they were available for both protocol groups. Overground walking distance was measured while people walked on the unit or in the hallway beside the therapy gym. Distances (metres) were recorded in the electronic medical record flowsheet as measurements for each bout of continuous walking. People were instructed to walk at a comfortable pace and were permitted to take breaks. Walking distance was calculated as the sum of all walking bouts in a single session. Gait aids and/or assistance were used as needed.

Exercise participation: The type of exercise, repetitions, sets, and weight used were recorded at the first and last recorded gym session, as well as gym frequency.

Physical therapy treatment goals: Goals were established at the initial assessment collaboratively with the physical therapists and patients and were recorded by type (ambulation, transfers, stairs, endurance, independent exercise program) using the standardized categories within the electronic medical record.

Outpatient rehabilitation

Upon discharge from inpatient rehabilitation, LTx recipients participated in a hybrid outpatient rehabilitation program (a mix of in-person sessions and home exercise) that included aerobic exercise targeting 20 minutes of treadmill or overground walking and resistance training for a minimum of 3 times per week between hospital discharge and three months post-LTx [16]. Treadmill walking distance was calculated by multiplying the treadmill speed in metres/minute by the

minutes walked on the treadmill.

2.5. Statistical Analysis

Statistical analysis was done using SPSS software version 29.0.1.0. Assumption of normality was examined using the Shapiro-Wilk test, and the assumption of equal variance was tested using Levene's test for continuous data. Descriptive statistics for continuous variables were reported as mean ± standard deviation for data that met the assumption of normality or median [interquartile range] for data that failed to meet the assumption of normality. Descriptive statistics for categorical data were reported as frequencies and percentages. Between-group differences (traditional and new protocols) for categorical variables were evaluated using the Chi-square test. Between-group differences for continuous variables were evaluated using the independent samples *t*-test or Mann-Whitney U test as a non-parametric alternative. Within-group differences for continuous variables were analyzed using the paired samples *t*-test or Wilcoxon Signed Rank test as a non-parametric alternative. A p-value of <0.05 was considered statistically significant.

3. Results

There were 396 people who underwent LTx at our transplant centre between June 1, 2022, and May 31, 2024. 166 (42%) were admitted to inpatient rehabilitation at the affiliate rehabilitation site, and 33 (20%) were admitted to fast-track inpatient rehabilitation. Thirteen people underwent the traditional protocol (June 15, 2022-August 31, 2023), and 20 people underwent the new rehabilitation protocol (September 1, 2023-.June 30, 2024). The only clinical change during this time period was the introduction of a streamlined electronic referral process to fast-track rehabilitation. Demographic and clinical characteristics are reported in Table 1. The mean age was 67 ± 8 and 58% were male. There were no differences between protocol groups for age, sex, pre-transplant diagnosis, intensive care unit or acute care LOS or urgency status for LTx. People who attended the traditional protocol had a longer inpatient rehabilitation LOS (15 [7] days vs 7 [2] days, p = 0.0001). There were no differences between protocol groups for 6MWD or lung function either before LTx or at three months post-transplant.

3.1. Change in Walking Distance During Inpatient Rehabilitation

On Day 1, the new protocol group walked farther (109 ± 56 vs. 69 ± 44, p = 0.043) and started exercise training on Day 0 (admission) rather than Day 1 for the traditional protocol. The traditional protocol group improved their walking distance between Day 1 and Day 6 (69 ± 44 vs 137 ± 55, P = 0.016), but not the new protocol group (109 ± 56 vs 128 ± 64, P = 0.445) (Table 2). There was no difference in the change in walking distance score between the traditional and new protocol groups (67 ± 81 m vs. 13 ± 68 m respectively, $P = 0.058$) or distance walked at Day 6 (137 ± 55 vs 128 ± 64, P = 0.696).

Table 1. Participant demographics and clinical characteristics (n = 33), mean ± SD, median [IQR], or n (%).

Characteristics	All (n = 33)	Traditional Protocol (n = 13)	New Protocol (n = 20)	*P-value*
Age (years)	67 ± 8	67 ± 5	65 ± 9	0.222
Sex				0.727
Male	19 (58)	7 (55)	12 (60)	
Female	14 (42)	6 (46)	8 (40)	
Pre-LTx Diagnosis				0.051
COPD	7 (21)	5 (38)	2 (10)	
ILD	26 (79)	8 (62)	18 (90)	
Length of Stay (LOS)[a]				
ICU	5 [7]	4 [9]	5 [5]	0.298
Acute	14 [8]	12 [9]	14 [9]	0.703
Total Acute	19 [9]	21 [10]	19 [10]	0.758
Inpatient rehab	9 [8]	15 [7]	7 [2]	**0.0001***
Transplant as Inpatient				0.245
Yes	9 (27)	5 (38)	4 (20)	
No	24 (73)	8 (62)	16 (80)	
Listing Status at Transplant[b,c]				0.837
Status 1	11 (33)	5 (38)	6 (30)	
Status 2	12 (36)	4 (31)	8 (40)	
Status 3	10 (31)	4 (31)	6 (30)	
Lung Allocation Score (LAS)	34 [4]	33 [11]	35 [2]	1.000
6MWD at Listing/Pre-LTx (meters)	300 ± 96	304 ± 80	298 ± 106	0.857
6MWD at Listing/Pre-LTx (% Predicted) [23]	47 ± 15	49 ± 12	46 ± 17	0.683
FEV_1 at Listing/Pre-LTx (L)	1.31 ± 0.67	1.23 ± 0.72	1.36 ± 0.64	0.596
FEV_1 at Listing/Pre-LTx (% Predicted)	47 ± 26	46 ± 30	48 ± 24	0.794
6MWD at 3 Months Post-LTx (meters)	391 [99]	391 [42]	391 [118]	0.850
6MWD at 3 Months Post-LTx (% Predicted)	62 [12]	61 [10]	62 [22]	0.957
Gait Aid at 3 Months Post-LTx[d]				0.467
Rollator Walker	10 (31)	5 (38)	5 (26)	
No Aid	22 (69)	8 (62)	14 (74)	
FEV_1 at 3 Months Post-LTx (L)	2.10 ± 0.85	2.17 ± 0.62	2.05 ± 0.95	0.560
FEV_1 at 3 Months Post-LTx (% Predicted)	76 [25]	81 [50]	72 [29]	0.372

Abbreviations: LTx, lung transplant; COPD, chronic obstructive pulmonary disease; ILD, interstitial lung disease; LOS, length of stay; LAS, lung allocation score (patient ranking for urgency of receiving a LTx depending on medical status and likelihood of post-LTx survival); 6MWD, six-minute walk distance; FEV1; forced expiratory volume in one second. [a]Total acute stay reflects the summation of ICU LOS and acute LOS (step-down unit and ward). [b]Status 1 - stable, Status 2 - deteriorating or has lung condition with potential to deteriorate, Status 3 - deteriorating rapidly (Canadian lung transplant listing urgency criteria). [c]n = 14 for all patients, n = 7 for both traditional protocol group and new protocol group. [d]n = 19 for traditional protocol group, n = 32 for all patients. *Indicated significant *P* value (<0.05).

Table 2. Change in walking distance during inpatient rehabilitation, mean ± SD, n (%)

	Traditional Protocol (n = 12)	New Protocol (n = 19)	*P*
Distance Walked on Day 1 (meters)	69 ± 44	109 ± 56	**0.043***
Distance Walked on Day 6 (meters)[a]	137 ± 55	128 ± 64	0.696
Change Score (meters)[b,c,d,e]	67 ± 81	13 ± 68	0.058
Gait Aid on Day 1 (Traditional Protocol n = 13; New Protocol n = 20)			**0.241**
No Aid	0 (0)	3 (15)	
Rollator Walker	10 (77)	15 (75)	
Two-Wheeled Walker	3 (23)	2 (10)	
Gait Aid on Day 6 (Traditional Protocol n = 13; New Protocol n = 18)			**0.266**
No Aid	4 (30)	6 (33)	
Rollator Walker	8 (62)	7 (39)	
Two-Wheeled Walker	1 (8)	1 (6)	
Cane	0 (0)	4 (22)	

Note: raw distance (meters) reported for distance walked on day 1 and day 6. [a]n = 13 for traditional protocol. [b]Change score calculated by determining the difference between distance walked on the first and last day of inpatient rehab. [c]n = 18 for new protocol. [d,e]Within-group differences in the change in walking distance between day 1 of inpatient rehab and day 6 of inpatient rehab was significant for the traditional protocol (p = 0.016*) and non-significant for the new protocol (p = 0.445). *Indicated significant *P* value (<0.05)

3.2. Cycling and Strength Training During Inpatient Rehabilitation

The proportion of people who completed cycle training was similar between the traditional and new protocols, 38% vs 55% respectively, $P = 0.353$, Table 3. Time spent cycling was also similar: 5 [10] vs. 15 [10] minutes respectively, $P = 0.221$. There was inconsistent reporting of cycling intensity (e.g., cycle level or workload, heart rate, oxygen saturation, Borg ratings of perceived exertion) [17]. On the last day of inpatient rehabilitation, people in both protocols completed a similar volume of all exercises except the sit-to-stand (STS) exercise which was lower in the traditional protocol (10 [1] vs. 15 [10], $P = 0.018$).

3.3. Physical Therapy Goals

People in both protocols set a minimum of two goals and a maximum of four goals. A greater proportion of people in the new protocol set goals related to independent transfers and an independence exercise program (79% vs. 38%, p = 0.02 and 74% vs. 15%, p = 0.001 respectively). Everyone set an ambulation goal with a specified distance, and people in the new protocol had higher ambulation distance goals (median 200 [150] m vs. 100 [62] m, p = 0.03) Figure 1.

Table 3. Inpatient rehabilitation participation, mean ± SD, median [IQR], or n (%).

	Traditional Protocol	New Protocol	*P*
Length of Stay (days)[a]	15 [7]	7 [2]	**0.0001***
NuStep Trainer (Day 6)			
Completed *n = 13,20*			0.353
Yes	5	11	
No	8	9	
Time (minutes) *n = 5,11*	5 [10]	15 [10]	0.221
Strength Assessment on First Day[b]			
SKE *n = 4,11*	20 [4]	10 [10]	0.056
STS *n = 6,9*	10 [4]	10 [10]	0.272
Hip Flexion *n = 10,16*	20 [10]	20 [8]	0.737
Hip Abduction *n = 9,12*	10 [10]	20 [10]	0.754
Hamstrings *n = 4,9*	15 [10]	10 [10]	0.940
Hip Extension *n = 5.7*	20 [5]	20 [10]	0.876
Standing Heel-Toe Raises *n = 5,7*	20 [0]	10 [10]	**0.048***
Strength Assessment on Last Day [b, c]			
SKE *n = 5,10*	20 [13]	20 [6]	1.000
Squats *n = 5,6*	10 [0]	10 [6]	0.429
STS *n = 6,9*	10 [1]	15 [10]	**0.018***
Hip Flexion *n = 7,15*	10 [10]	15 [10]	0.490
Hip Abduction *n = 7,14*	10 [10]	17.5 [10]	0.360
Hamstrings *n = 5,13*	10 [5]	10 [10]	0.443
Hip Extension *n = 5,9*	10 [5]	15 [10]	0.190
Standing Heel-Toe Raises *n = 5,12*	15 [10]	20 [10]	0.574

Continued

Stair climbing at discharge			
Number of Steps *n = 8,13*	9 [2]	12 [12]	0.104

Abbreviations: SKE, seated knee extensions; STS, sit-to-stands. [a]n = 13 for traditional protocol, n = 20 for new protocol. [b]Inpatient strength assessment metrics calculated by multiplying number of sets by number of repetitions completed. [c]Last day is different between groups due to longer inpatient rehabilitation stay for the traditional protocol (15 [7] days) compared to the new protocol (7 [2] days). *Indicated significant *P* value (<0.05).

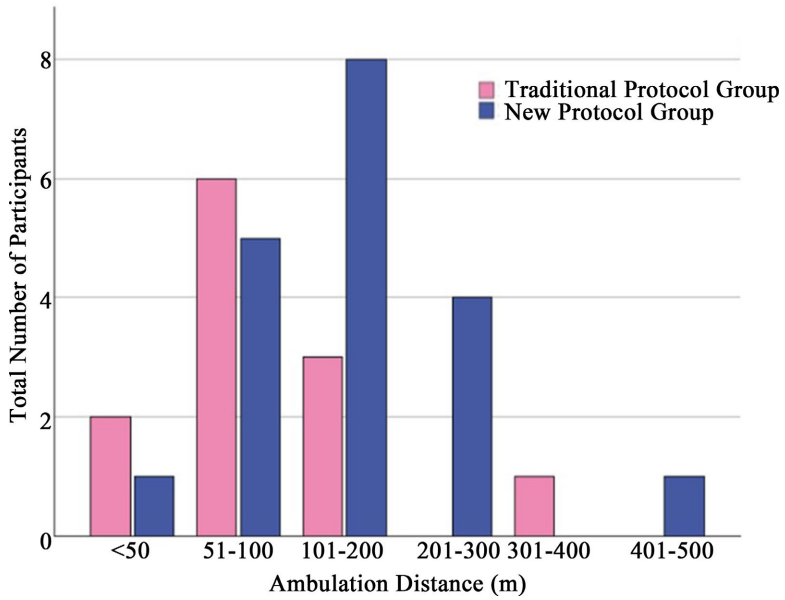

Figure 1. Ambulation distance goals set for the traditional protocol and new protocol groups.

3.4. Change in Walking Distance from Inpatient Rehabilitation to Outpatient Rehabilitation

Both groups walked significantly longer distances during the first week of outpatient rehabilitation compared to the end of inpatient rehabilitation (traditional protocol 362 [503] m vs. 160 [65] m, p = 0.001 and new protocol 536 [456] vs. 150 [120] m, p < 0.001). The time between inpatient rehabilitation discharge and the start of outpatient rehabilitation for both groups was similar (traditional protocol change 6 [4] days vs. new protocol change 7 [4] days, p = 0.53).

4. Discussion

The new, rehabilitation protocol achieved comparable Day 6 walking distances in this small retrospective cohort. Exercise training was able to start on the day of admission, suggesting that a higher intensity, shorter duration program may optimize allocation of acute care, rehabilitation resources, and functional recovery for high functioning LTx recipients. People in the new protocol set higher ambulatory distance goals and more independent exercise goals. One study that ran-

domized LTx recipients to standard inpatient rehabilitation care that included once-daily physiotherapy sessions or an intensive inpatient rehabilitation protocol involving twice-daily physiotherapy sessions found that intensive acute physiotherapy after LTx was feasible and safe [9].

It was anticipated that people participating in the new protocol would have a greater change in walking distance; however, no difference was observed. This does not align with the higher ambulation distance goals that were set. Scheduled therapy that focused on progressing ambulation to less supportive gait aids (from a walker to a cane or no aids) may explain the lack of change in walking distance throughout inpatient rehabilitation. It is also possible that, due to the novelty of the new protocol exceeding expectations for baseline walking ability and distance, physiotherapists need to adjust to a new functional benchmark to optimize ambulatory outcomes in the new protocol. Nevertheless, similar changes in walking distance between both groups demonstrated that comparable walking distances were achieved in a shorter time frame. These findings add to the limited literature regarding rehabilitation LOS targets for post-LTx recipients with higher functional status. A study by Shiner *et al.* found an average LOS of 27 days in inpatient rehabilitation for heart and lung transplant recipients, though this finding was influenced by high variability in recipient comorbidities and medical challenges, and lacked specificity to higher functioning LTx recipient sub-group [15].

Similar aerobic, resistance, and exercise training volumes during inpatient rehabilitation were reported between the groups. Despite the focus of the new protocol to increase aerobic cycling endurance, there was a lack of data on subjective and objective measures of aerobic exercise intensity, which may limit the ability to individually progress exercise. During strength training, people in the traditional protocol performed more heel-toe raises on Day 1. This exercise aims to improve balance and functional gait. Fujimoto *et al.* found that weakness in ankle dorsiflexors impairs older adults' ability to restore their balance when in a position where they are standing on their toes [18]. Andre *et al.* demonstrated that a calf-raise test can be used in community-dwelling older adults to assess ankle strength and consequently, their performance in ADLs [19]. This suggests that the focus of the traditional protocol was on training balance and functional gait. The new protocol prioritized more advanced functional exercises such as the STS which is a functional measure associated with 6MWT, gait speed, lower extremity strength, and exercise capacity in transplant recipients [13] [20]. A study by Mayer *et al.* found that pre-LTx 5-time STS performance correlates with post-LTx functional mobility prognosis, suggesting that the STS measure can be used pre-transplant as an indication of functional recovery [21]. Considering that STS provides carryover to other functional movements, performing this exercise could expedite discharge. Inpatient rehabilitation could consider adding a STS test to assess functional mobility throughout the hospital LOS [13]. Similarly, upper extremity exercises have also been shown to play a significant role in basic and instrumental ADLs [2]. However, data on upper extremity exercises was not collected as this is

not part of the fast-track pathway, and upper extremity strength training is limited in the first 3 months post-LTx to allow for incisional healing [2].

Overground walking, not a treadmill, was used during inpatient rehabilitation. Treadmill use in outpatient rehabilitation allows for a higher patient-to-therapist ratio, compared to the 1:1 patient-to-therapist ratio used during inpatient rehabilitation. Incorporating treadmill training in inpatient rehabilitation may enable more treatment time dedicated to building walking endurance and allow therapists to accurately make objective measures of walking intensity (treadmill speed and time) which could facilitate more precise tracking and assessing walking progress.

5. Limitations

The small, fixed sample size limits the statistical power and generalizability. This time frame was chosen as the electronic health record was implemented at our institution in June 2022 and the new fast-track rehabilitation protocol was implemented in September 2023. Missing data arose from inconsistent reporting and documentation, and variability in formatting. Unavailable metrics of exercise intensity during therapy sessions, such as heart rate and Borg scores, limit the evaluation of exercise prescription and progression. Variability of patient admission and discharge timing impacted treatment fidelity as therapists covering weekend shifts opted to complete only some parts of the treatment program which may have been due to their unfamiliarity with the new protocol. In Canada, hospital care including inpatient rehabilitation is covered by universal health coverage, therefore there may be limited generalizability to centres with different inpatient rehabilitation accessibility and coverage.

6. Future Directions

Clinical practice should incorporate fidelity monitoring tools, such as structured therapy session checklists for electronic medical record entry and periodic audits, to track whether new protocols are delivered and reported as intended [22]. Wearable monitoring technology could be used to record exercise intensity metrics such as heart rate. Further, incorporating a qualitative component, such as semi-structured interviews or focus groups with physical therapists and LTx recipients could provide insight into barriers to treatment documentation, program adherence, and patient engagement. Lastly, treadmill walking as a mode of ambulation could be considered in inpatient rehabilitation in addition to overground walking to facilitate longer durations and better prepare people for outpatient rehabilitation and community ambulation.

7. Conclusion

Despite a shorter length of stay, LTx recipients in the new fast-track inpatient rehabilitation protocol had comparable walking distances and exercise participation. Future practice should standardize the recording of biometric data and re-

habilitation participation to improve reporting adherence for data comprehensiveness.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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