

ACADEMY OF SPINAL CORD INJURY PROFESSIONALS



Dynamic Variable Exoskeleton Gait Training Following Spinal Cord Injury in Inpatient Rehabilitation: A Case Series.



Lindsey Wynne, PT, DPT, NCS¹; Danae Arnold, PT, DPT, ATP²; Jaime Gillespie, PT, DPT²; Chad Swank, PT, PhD, NCS^{1,2};
Molly Trammel, PT¹; Seema Sikka, MD¹; Faith Meza, BS²; Angelo Abis, PT, DPT¹;
¹Baylor Institute for Rehabilitation, Dallas, Texas, ²Baylor Scott & White Research Institute, Dallas, Texas.

CONTEXT

Promoting gait adaptability is critical to improve walking recovery following spinal cord injury (SCI).

Advanced robotic exoskeleton technology of contemporary devices allows for overground exoskeleton gait training (OEGT) to include multidirectional stepping, variable device assistance, and resistance with step trajectory.

METHODS

- Design:** Case Series
- Setting:** Inpatient Rehabilitation Facility
- Participants:** 3 patients [males, aged 29 to 51 years, with tetraplegia, ASIA Impairment Scale D (AIS D)]
- Outcome Measures:**
 - OEGT Session Data:
 - Heart Rate
 - Walk Time
 - Total Steps
 - Rate of Perceived Exhaustion (RPE)
 - Heart Rate Intensity
 - Total Session Count
 - Functional Mobility:
 - Walking Index for Spinal Cord Injury (WISCI-II)
 - 10 meter walk test (10mWT)

RESULTS

Table 1. OEGT Session Characteristics

Patient	Average Heart Rate during OEGT	Average Walk Time in OEGT (minutes)	Average Steps in OEGT	Average RPE during OEGT	Percentage of Session Spent in Moderate Heart Rate Intensity	Percentage of Session Spent in Vigorous Heart Rate Intensity	Number of OEGT Sessions with Multidirectional Stepping
Patient 1	77	21:03	1290	2	34%	1%	2
Patient 2	114	18:24	835	6	75%	2.5%	4
Patient 3	94	21:40	664	5	36%	22%	3

CONCLUSIONS

Contemporary exoskeleton devices allow for dynamic stepping tasks beyond passive and active assistance gait training.

Dynamic stepping tasks were incorporated during OEGT for 3 patients with AIS D tetraplegia SCI to maximize gait training progression during inpatient rehabilitation.

Physiologic and patient-reported indicators of cardiovascular intensity suggest dynamic stepping tasks during OEGT were tolerated without undue burden.

Figure 1a. Changes from admission to discharge for WISCI-II

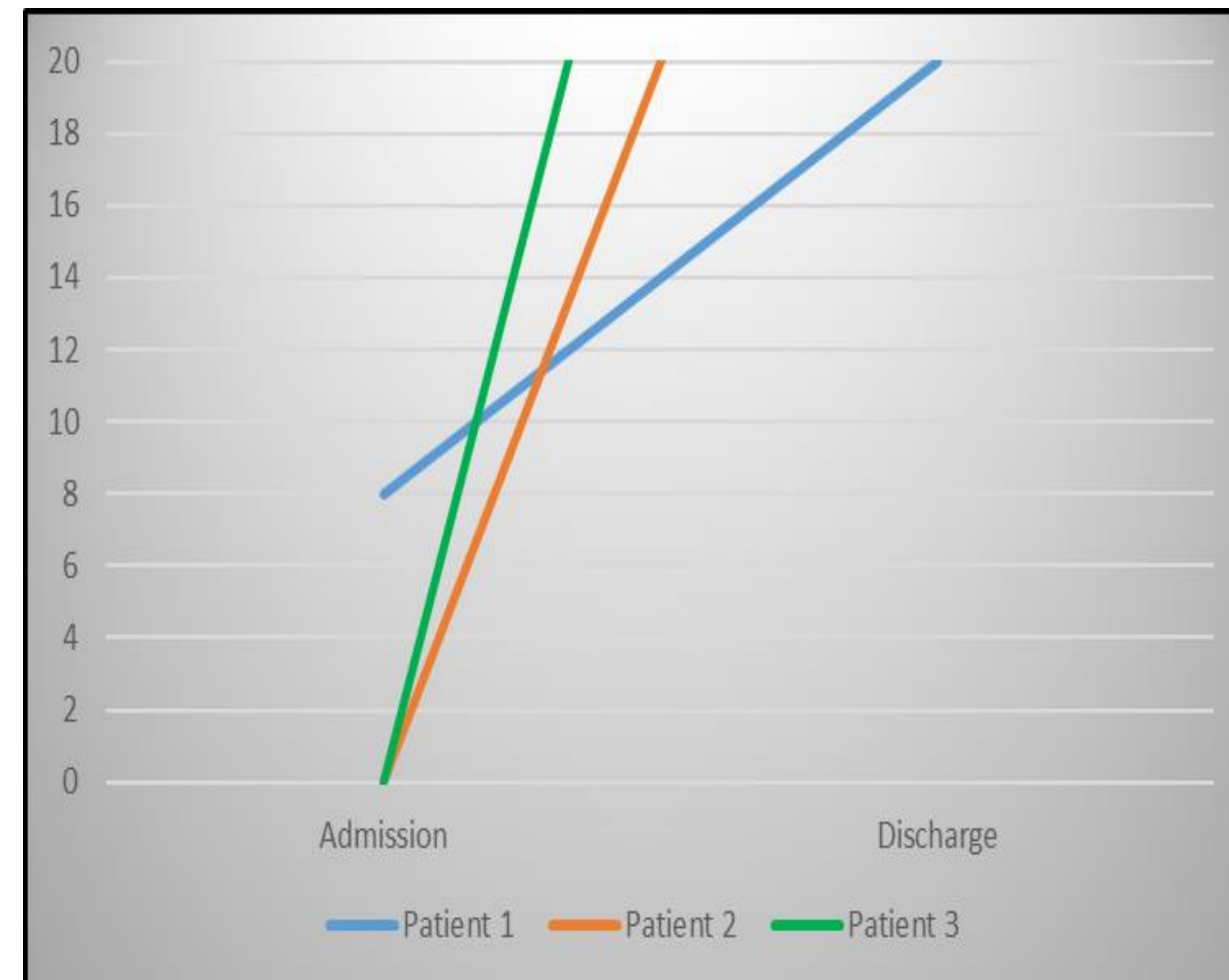


Figure 1b. Changes from admission to discharge for 10mWT

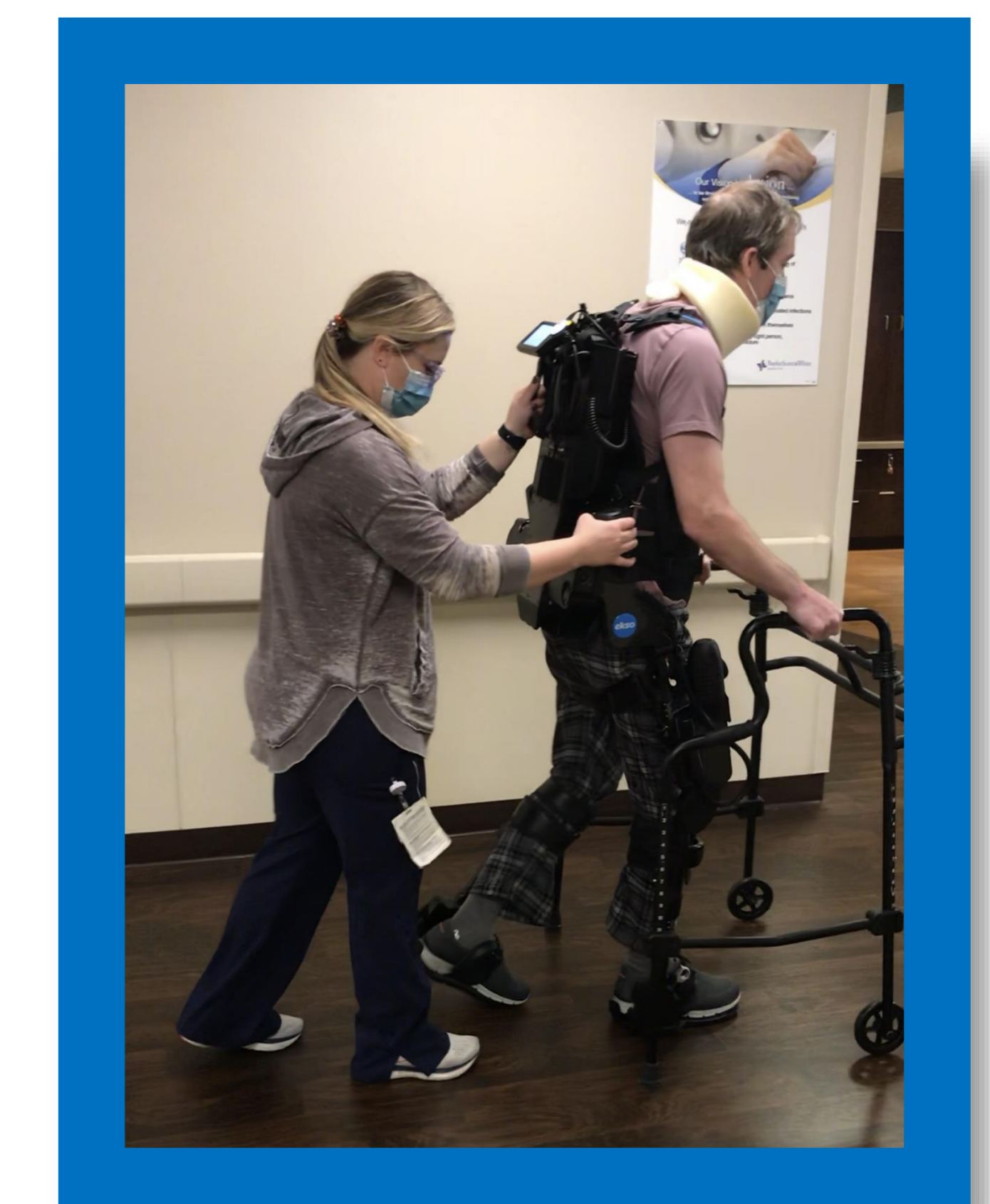
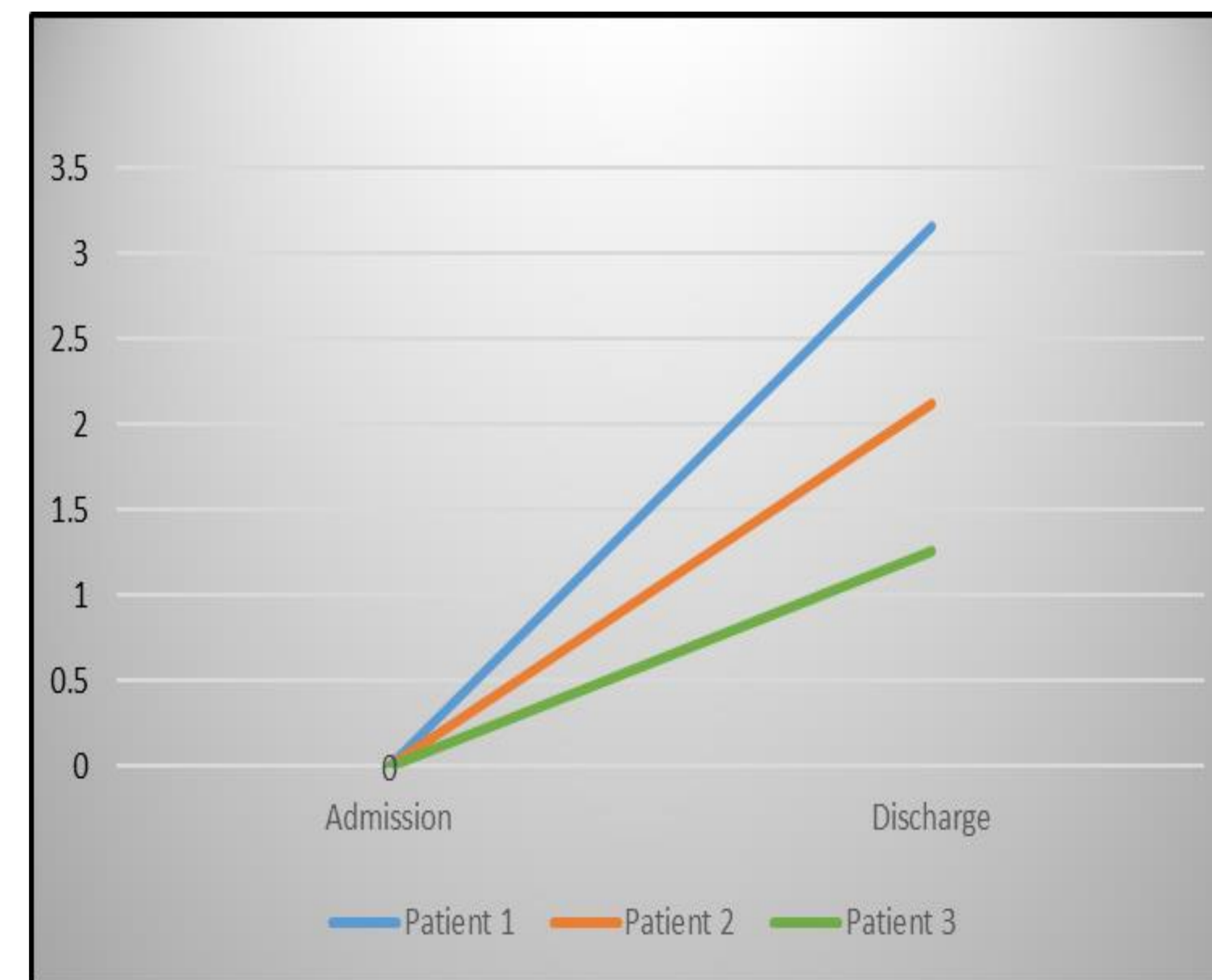


Figure 2. Utilization of dynamic stepping tasks during OEGT