Use of Technology on Patient Outcomes in Inpatient Rehabilitation: Highlighting the Challenges in Heterogeneous Patient Populations

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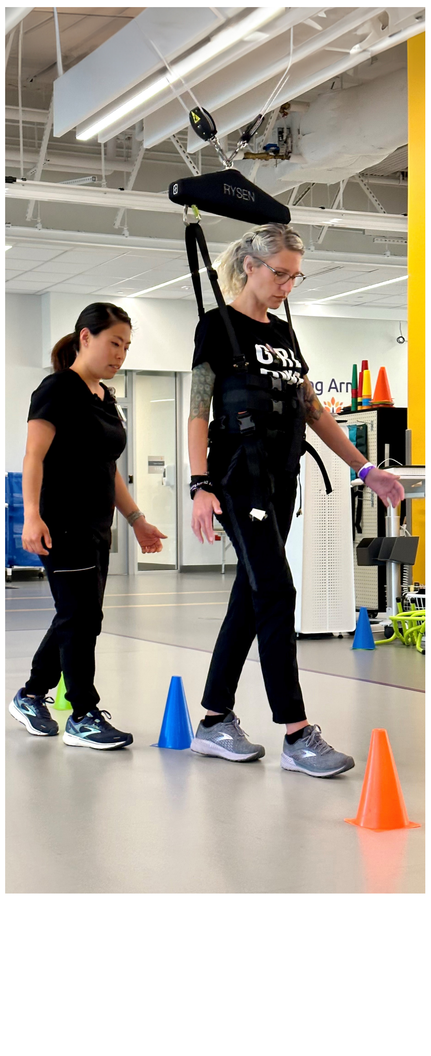
INTRODUCTION & PURPOSE:

This year, the clinical science department at Sheltering Arms Institute leveraged our partnership with VCU research team to examine association between use of rehabilitation technology and patient outcomes. While the benefits of inpatient rehabilitation are widely understood, it has proven difficult to establish these associations between use of advanced treatment with improved patient outcomes. SAI has the benefit of a wide array of advanced rehabilitation technology to utilize.

METHODS:

We conducted secondary analysis of data collected as part of standard of care with advanced rehabilitation technology at SAI and the outcomes collected. We used data from 2020-2023. The questions we were interested in answering were:

1. **Does use of body weight supported (BWS) technology greater than 2 sessions by persons with stroke result in higher change scores in walking 50 feet, as collected in the CARE tool?**
2. **Does use of upper limb advanced rehabilitation technology by persons with tetraplegia after spinal cord injury result in higher eating change scores, as reported in CARE tool?**



For question 1 our primary variable of interest, use of BWS, was divided into three categories: less than 3 sessions, 3-5 sessions, and greater than 5 sessions. The outcome variable, walk 50 feet, was categorized into binary: greater than 4, and less than 4. A score of 4 on the CARE tool correlates to Supervision to Touch Assist. Higher scores indicate greater independence. We conducted sequential Logistic Regression models adjusting for: age, gender, diagnosis (ischemic versus hemorrhagic stroke), level of comorbidities, case-mix groups (CMG), and admission Walk 50' score.

For question 2 our primary variable of interest, use of upper limb advanced rehabilitation technology, was operationally defined as number of sessions completed with any upper limb advanced rehabilitation technology over their entire length of stay. The outcome variable, eating discharge score, was categorized into binary: greater than 4, and less than 4. A score of 4 on the CARE tool correlates to Supervision to Touch Assist. Higher scores indicate greater independence. We conducted sequential Logistic Regression models adjusting for: age, gender, level of comorbidities, case-mix groups (CMG), and admission Eating score.

RESULTS:

For question 1, in unadjusted analysis, we found three times higher odds of achieving higher than score of 4 for those patients with 5 or more sessions with BWS relative to those with less than 3 sessions: OR=3.0 (95% CI=1.81-4.96). however, after adjusting for all the covariates, the association was not statistically significant.

For question 2, in fully adjusted model, we found 1.17 times higher likelihood for patients with SCI to achieve higher than 4 on discharge Eating score with increased in use of upper limb advanced rehabilitation technology: OR=1.17 (95% CI=1.01-1.36).

TABLE 1: Does use of BWS technology for greater than 2 sessions by persons with stroke result in higher change scores in walking 50 feet?

	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5
BWS 3-5 vs <3	1.67(1.0-2.80)	1.69(1.01-2.84)	1.67(0.99-2.81)	1.54(0.90-2.63)	0.86(0.44-1.70)
BWS 5+ vs <3	3.00(1.81-4.96)	3.07(1.84-5.10)	3.23(1.93-5.43)	2.73(1.61-4.62)	0.82(0.41-1.61)
Age		1.00(0.99-1.02)	1.01(0.99-1.02)	1.00(0.99-1.02)	1.00(0.98-1.02)
Gender F vs M		1.16(0.76-1.78)	1.25(0.81-1.92)	1.26(0.81-1.97)	1.22(0.72-2.09)
Diagnosis I vs H			0.94(0.57-1.56)	0.96(0.57-1.60)	1.88(1.01-3.5)
Tier Mod vs Sev			0.66(0.3-1.48)	0.67(0.29-1.53)	1.29(0.49-3.36)
Tier NoCom vs Sev			0.38(0.16-0.87)	0.37(0.16-0.87)	0.78(0.29-2.11)
Admit Walk 50 feet Score >4 vs <4				0.06(0.01-0.49)	0.74(0.09-6.23)
CMG					3.06(2.41-3.88)

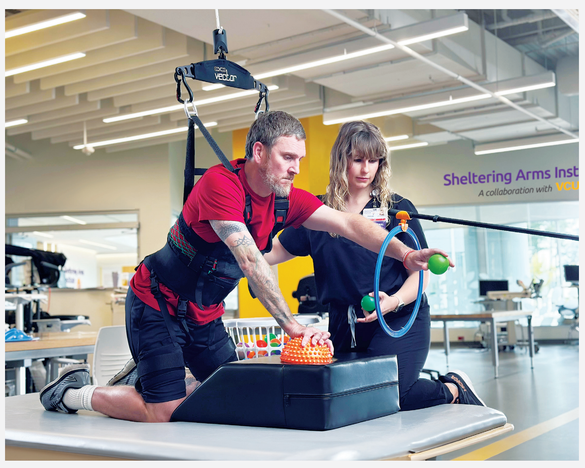
TABLE 2: Does use of upper limb advanced rehab technology by persons with tetraplegia after SCI result in higher eating change scores?

	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5
Upper Limb % Use	1.05(1.00-1.10)	1.05(1.00-1.10)	1.05(1.00-1.11)	1.11(1.01-1.24)	1.17(1.01-1.36)
Age		1.0(0.95-1.05)	0.99(0.95-1.04)	1.02(0.94-1.11)	1.01(0.91-1.11)
Gender F vs M		0.37(0.06-2.19)	0.42(0.07-2.70)	0.66(0.04-10.50)	0.02(0.001-12.6)
Tier Mod vs Sev			0.19(0.02-1.92)	0.08(0.004-1.74)	0.08(0.002-2.35)
Tier NoCom vs Sev			0.39(0.09-1.64)	0.20(0.02-1.97)	0.25(0.02-2.90)
Admit Eating Score >4 vs <4				0.10(0.01-0.92)	0.04(0.004-0.44)
CMG					1.06(0.98-1.14)

DISCUSSION:

Our results indicate that using BWS in more than 3 sessions could increase change scores in the patient's ability to walk 50 feet. This analysis also indicates that increased use of upper limb advance technology was associated with increased independence with eating. SAI has invested in advanced rehabilitation technology with the strong belief in its benefits to our patients' outcomes. The clinical science team plan to continue to work on additional analysis to prove technology's value for specific patient populations and to create guidelines for best use for clinicians.

Larger sample sizes of patient information and breaking down sample sizes to group patients will also benefit the analysis. Ensuring documentation of technology in discrete data points will assist with gathering larger sample sizing.



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ACKNOWLEDGEMENTS:

Amber Walter PT, DPT, NCS; **Charmi Kanani** MDA, MBA