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Clinician adherence to a standardized assessment battery across settings and disciplines in a poststroke rehabilitation population

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Running Title: Adherence to assessments in stroke

Title: Clinician adherence to a standardized assessment battery across settings and disciplines in a post-stroke rehabilitation population

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Appendix: 1

Abstract

Objective: 1) Examine clinician adherence to a standardized assessment battery across settings (acute hospital, IRF, outpatient facility), professional disciplines (PT, OT, SLP), and time of assessment (admission, discharge/monthly), and 2) evaluate how specific implementation events affected adherence.

Design: Retrospective cohort study

Setting: Acute hospital, IRF, outpatient facility with approximately 118 clinicians (PT, OT, SLP).

Participants: 2194 participants with stroke who were admitted to at least one of the above settings. All persons with stroke undergo standardized clinical assessments.

Interventions: N/A

Main Outcome Measure: Adherence to Brain Recovery Core assessment battery across settings, professional disciplines and time. Visual inspections of 17 months of time-series data were conducted to see if the events (e.g. staff meetings) increased adherence ≥ 5% and if so, how long the increase lasted.

Results: Median adherence ranged from 0.52 to 0.88 across all settings and professional disciplines. Both the acute hospital and IRF had higher adherence than the outpatient setting ($p \leq .001$) with PT having the highest adherence across all three disciplines ($p < .004$). Of the 25 events conducted across the 17 month period to improve adherence, 10 (40%) resulted in a ≥ 5% increase in adherence the following month, with 6 services (60%) maintaining their increased level of adherence for at least one additional month.

Conclusion: Actual adherence to a standardized assessment battery in clinical practice varied across settings, disciplines and time. Specific events increased adherence 40% of the time with gains maintained for greater than a month in 60%.

Key Words: assessment, adherence, rehabilitation

Abbreviations:

IRF: Inpatient Rehabilitation Facility

PT: Physical Therapy

OT: Occupational Therapy

SLP: Speech-Language Pathology

Measurement of patient outcomes and health status continue to be recognized as an essential component of rehabilitation clinical practice.[1-5] Although measurement itself has not been identified as improving patient outcomes, the implication is that standardized assessment can facilitate continuity of care, assist in provider decision making, and determine patient's prognosis and function over time.[1, 6-9] Despite these benefits, actual use of standardized assessment in clinical practice remains a challenge.[1, 10]

In a survey of 1,000 physical therapists (PT), it was found that use of standardized measures across different patient conditions and practice settings was not part of routine clinical practice.[1] In a separate study, the majority of surveyed speech language pathologists (SLP) describe using their own or non-standardized/informal assessments to assess communication deficits in patients post-stroke.[9] Despite mandated standardized measures, some groups report that 92% have never used the scores in their clinical practice (e.g. diagnostic evaluation, treatment planning or monitoring).[6] Rehabilitation professionals (occupational therapists (OT), PT, nursing) have identified many challenges such as organizational policy and procedures, clinician competence and beliefs, and the measurement itself (pieces of equipment, time to administer) as barriers to the implementation of standardized assessments into everyday clinical practice.[7, 11-14] Literature examining how to implement change within the healthcare system has shown that targeted, prospective efforts are more likely to improve professional practice[15] and that specific strategies such as audit and feedback or educational meetings can be useful as well.[16-19]

In 2008, the Brain Recovery Core (BRC) was developed as a partnership between Washington University School of Medicine, Barnes Jewish Hospital, and The Rehabilitation Institute of St. Louis.[20] The BRC is a system of organized stroke rehabilitation across the continuum of care, from the acute stroke service to return to home and community life. As part of the system, clinicians (PT, OT, SLP) administer a standardized battery of assessments that cover stroke-induced impairment, function and activities of

daily living. Lack of clinician adherence was a chief concern during development of the BRC and it is arguably the most common reason for failure of clinical databases that manage these assessments.[8] Strategies including audit, feedback and educational meetings were utilized to promote adherence.

With the continuous demand for standardized assessments in everyday clinical practice it is critical to report on efforts of implementation and to examine actual adherence. Adherence was operationally defined as the percentage of time all standardized measures were completed at each required time point. The purpose of this study is to report on-going clinician adherence to standardized assessments in patients post-stroke across settings (acute hospital, inpatient rehabilitation facility (IRF), outpatient facility) and professional rehabilitation disciplines (PT, OT, SLP).

Methods

This retrospective cohort study utilized 2194 participant records stored in the Brain Recovery Core database from August 2010 through December 2011.[20, 21] All participants admitted to Barnes-Jewish Hospital and The Rehabilitation Institute of St. Louis undergo standardized assessments by professional discipline PT, OT, and SLP. This battery was developed with both therapist and administrative input to meet the needs of participants and clinicians at each facility across the rehabilitation continuum, and it is considered the minimum assessment requirement for all persons with stroke. The battery encompasses the domains of motor (PT, OT), cognition (OT, SLP) and language (SLP) (see Appendix 1 for a brief summary), with approximately nine measures in the PT battery, 14 in the OT battery and 16 in the SLP battery.[20] Each measure is not required at every setting. As reflects the clinical needs, the measurements begin as more impairment-based for the acute setting while the outpatient assessments include participation measures. Only a portion of the measures required at the admission assessment are required for the discharge (IRF) or monthly (outpatient) assessments. In addition, some

assessments are conditional based on participant results on brief screening measures. For example, the 15-item Boston Naming Test[22] is used as a screen for possible aphasia. If a participant fails the Boston Naming test, they are then given the Western Aphasia Battery[23] to determine if aphasia is present, and if so subsequent aphasia measures are administered. However, if the participant passes the Boston Naming Test screen than none of the subsequent aphasia measures are administered, thus the evaluation would take less time. The time to complete assessments mirrors the time given at each setting for an evaluation and are presented in Table 1. Rehabilitation data (assessment scores) are stored from participants across all three settings (acute hospital, IRF, outpatient facility) and professional disciplines (PT, OT, SLP). All participants entered into the database have a primary stroke diagnosis, have received standard rehabilitation services as prescribed by licensed clinicians at each facility and have provided informed consent to have their stroke rehabilitation data stored and used for research. Washington University Human Research Protection Office has approved the database and studies using de-identified data.

The acute hospital setting assessments are completed once a patient is stabilized and rehabilitation services are ordered, usually within 24 hours of admission. The IRF setting assessments are completed within 48-72 hours of admission and discharge. The outpatient setting assessments are completed at admission (first 1-2 visits) and then on a monthly basis. All assessments are administered by licensed clinicians who have been trained on these assessments, complete annual competencies on them, and who are observed for consistency. Each month, clinician-specific and measure-specific feedback on adherence (defined as all measures completed at their specific time point) were extracted from the database and provided to the clinician managers. Managers used policies and procedures already in place at each setting to disseminate feedback to staff clinicians. Various events (e.g. staff meetings at each setting and within each professional discipline) were held periodically throughout the 17 month time period. Events typically included: presentation of previous monthly adherence,

discussion and feedback of individual assessments, interpretation and application of assessment results, and identification and solution of barriers affecting adherence.

Statistical Analysis

SPSS version 19 (IBM Corporation; Armonk, New York) was used for all statistical analyses and the criterion for statistical significance was set at $p < 0.05$. In this analysis, the data of interest (individual unit in the analysis) is the assessment by a clinician of an individual participant at a specific time point along the rehabilitation continuum. Each assessment is required to be completed 100% of the time, regardless of whether or not it was completed at other settings or in other disciplines. The same participants were evaluated at more than one facility and by more than one discipline at each facility with less than 5% of participants seen for only one evaluation at only one facility. Likewise, each clinician performed assessments on multiple participants over the 17 month time period. Data were aggregated across individual assessments and not across individual participants or individual clinicians. Non-parametric analyses were selected because of violations in the normality assumption. A Friedman two-way analysis of variance by ranks was used to determine if adherence to the Brain Recovery Core assessment battery differed across settings and professional disciplines. Settings (acute hospital, IRF, outpatient facility) and professional disciplines (PT, OT, SLP) were considered within group factors for this analysis. For significant results, a Wilcoxon Signed-Ranks test with Bonferroni's Correction ($p < 0.008$) was performed post-hoc. A similar analysis was repeated to compare if adherence to the assessment battery varied based on when the assessment was administered at the IRF (admission, discharge) and outpatient (admission, monthly) settings (Bonferroni's Correction ($p < 0.013$)). Percent adherence was then plotted and visual inspection of time-series data was conducted to see if events increased adherence ≥ 5% and if so, how long the increase in adherence lasted. An improvement equal

to or greater than 5% was selected to determine if any association could be found between events and improvement in adherence. Although somewhat arbitrary, 5% was considered sufficient to indicate a real improvement in adherence but not too high of an expectation.

Results

The majority of clinicians treating participants post-stroke across all three settings were female and professional experience ranged from 0-35 years. Average yearly turnover rate is 5-10% across disciplines (Table 1). The demographics and distribution of stroke participants across services is shown in Table 2.

Figure 1 shows adherence rates by setting (rows) and disciplines (columns) on a monthly basis. Median adherence ranged from 0.52 to 0.88 across all settings and professional disciplines (Table 3). Friedman's test statistic $\chi^2(8) = 81.454$ was significant ($p < .001$). Post hoc testing was conducted to examine differences across settings and disciplines. Of the three settings, the acute and IRF settings were not significantly different ($p = .256$), however both had significantly higher adherence than the outpatient setting ($p \leq .001$). Of the three disciplines PT had the highest adherence, followed by OT and then SLP ($p < .004$). At the IRF and outpatient facility, adherence with the admission assessment was greater than with the discharge or monthly assessment, respectively, and more IRF discharge assessments were completed than outpatient monthly assessments (Table 3; $p \leq .002$).

For the duration of the 17 month time period, feedback was provided on a monthly basis to managers at each setting showing actual clinician- and measure-specific adherence to the required assessment battery. In addition, 25 events were conducted across settings and disciplines throughout the 17 month period to improve adherence. Of these 25 events, 10 (40%) were followed by a ≥ 5%

187 increase in adherence the following month (Figure 1). Of the 10 events that resulted in increased
188 adherence, 6 services (60%) maintained their increased level of adherence for at least one additional
189 month. For example, in April the SLPs' at the acute setting had an event. In the following month, May
190 there was a greater than 5% increase in adherence and that gain was maintained for an additional
191 month, June.

192

193 **Discussion**

194 This report offers new information examining clinician adherence across both professional
195 rehabilitation discipline and setting among clinicians treating the post-stroke population. Median
196 clinician adherence to the standardized assessments of the BRC varied from 0.52 to 0.88 across a 17
197 month period. The acute hospital and IRF settings and professional discipline of PT were found to have
198 the highest adherence. Admission assessments were more often completed than the discharge or
199 monthly assessments. Throughout this time period, monthly clinician- and measure-specific feedback
200 was provided and staff events were held. In the month following an event, there was an increase in
201 adherence 40% of the time and this was maintained for an additional month in 60% of those cases.

202 Data on clinician adherence to standardized assessments has been most commonly collected via
203 self-report/survey.[1, 4, 10, 24] Although this method is able to encompass a wider distribution of clinicians
204 and is quicker, it is potentially biased by the clinician's perception of adherence to standardized
205 assessments versus actual adherence. The current study is an important addition to the literature on
206 clinician adherence, as it reports actual adherence to standardized assessments across settings and
207 disciplines. Despite the difference in methodology, clinician adherence presented in this report is
208 generally equivalent with other published studies (48-70% adherence).[1, 4, 25, 26] In similar clinical
209 databases targeted at acute physical therapy clinical practice, full adherence to the computerized

system was found.[8] In that project, an electronic medical record system was built utilizing the defined measures that clinicians were expected to complete. Here in the BRC, the acute hospital is the only setting with an electronic medical record. This may, in part, explain why a higher level of adherence was seen in the acute setting when compared to the outpatient facility. In addition, it is noted that the clinician turnover rate is twice as high in the acute setting, yet they have significantly higher adherence than the outpatient facility. These findings in addition to a third survey[10], are in sharp contrast with self-report data indicating that outpatient therapists are four times more likely than acute therapists and 10 times more likely than inpatient rehabilitation therapists to use standardized outcome measures.[1]

Audit and feedback techniques have been shown to improve clinical practice through increasing adherence to clinical guidelines.[16-18] Monthly audits of missing data were conducted throughout the 17 month period with the information disseminated back to the clinicians. Despite this process, no trend or steady improvement over time was detected across setting or professional discipline. Structured events, which have been shown to improve clinical practice[19], were held, but were followed by improved adherence the following month only 40% of the time. Since the increased adherence was sustained for an additional month 60% of the time, we were only effective in increasing longer-term adherence 24% (6/25) of the time an event was held. Collectively, these numbers indicate that sustainability of uniform standardized assessment use in clinical practice is complex. Using implementation and sustainability methods suggested by the healthcare implementation literature had only small influences on adherence. New methods for promoting adherence and sustaining adherence clearly need to be developed.

It is unclear if the higher adherence seen in PT is a reflection of discipline versus time to complete the required assessments. Broad agreement and discussion about common use of standardized assessment tools has been a focus of the discipline of PT[1, 4, 5, 7, 8, 10, 12, 27] for a greater

duration of time compared to OT[28, 29] and SLP.[30, 31] As a result, completion of the BRC standardized assessment battery may have been a more natural transition leading to higher adherence in PT compared to the other disciplines. Another factor that may explain different adherence rates across disciplines is the time to complete assessments. Both OT and SLP assess two domains, whereas PT assesses only one domain. OT assessed motor and cognition as well as screened for language deficits and SLP assessed both cognition and language. PT however only assessed the motor domain. As a result the standardized assessments were more encompassing for OT and SLP, yet each battery was designed to be completed in the time allotted for an evaluation at each setting. Exceptions requiring longer assessments times were seen across clinicians and in patients with greater deficits as was expected. Nonetheless, clinicians were generally able to complete the evaluations within the required timeframes. It is therefore difficult to ascertain whether the higher adherence seen in PT is an artifact of discipline history with standardized assessments or if it is due to the length of the assessments.

Study Limitations

Two limitations are important to consider when interpreting these results. First, the majority of the patients were evaluated by multiple disciplines and at more than one setting. Less than 5% of patients were evaluated at only one setting and by only one discipline. From a statistical perspective, our data violate the assumption of independent observations. There is no way to avoid this violation because post-stroke rehabilitation across the continuum of care is an interdisciplinary endeavor. The acute hospital requires evaluation of all participants post-stroke by both physical and occupational therapy, with results on several measures triggering speech-language pathology evaluation. The IRF requires an admission evaluation by all three disciplines. It is common that participants will require services after discharge from the acute care hospital and will then receive services from the IRF and/or

outpatient facility. Likewise, each therapist evaluated numerous patients in the data set. It is possible that particular patients might be more likely to have completed all the assessments (e.g. a person with very mild stroke) or be less likely to have completed all the assessments (e.g. a person with severe stroke). Despite this potential bias, we were still able to detect differences in adherence across disciplines and settings.

Second, although feedback was provided monthly to hospital administrators at each facility, it was up to the manager and current facility policies on how this information was disseminated to the individual clinician. Different supervisors and facilities may have more or less effective strategies to encourage adherence to the standardized assessments and this may have been reflected in the results of this report.

Conclusions

Our results indicate that actual adherence to a standardized assessment battery differs across settings and across disciplines. Continuous audits of the medical record, clinician-specific feedback, and events specifically focused on increased adherence were not as effective as desired. Substantial, ongoing effort is therefore needed to maintain and/or increase sustainability of using standardized assessment batteries in stroke rehabilitation. Future work is needed to develop new processes to promote adherence and then to test the effectiveness of those processes.

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Figure 1

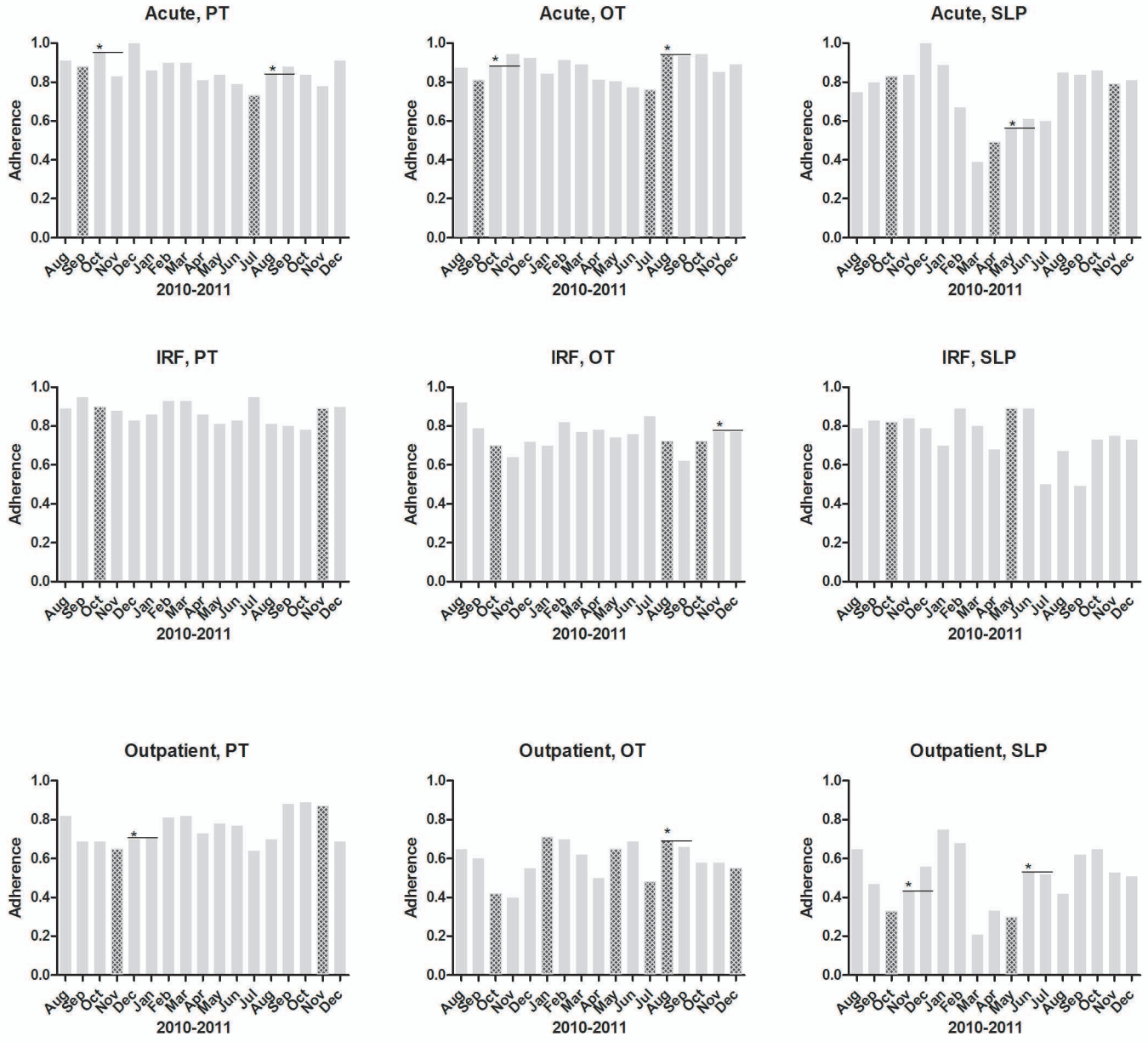
Acute, PT
Acute, OT
Acute, SLP
IRF, PT
IRF, OT
IRF, SLP
Outpatient, PT
Outpatient, OT
Outpatient, SLP
Adherence
0.0
0.2
0.4
0.6
0.8
1.0
Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2010-2011
*

Figure Legends

Figure 1: Percent adherence to measures across setting (horizontal) and discipline (vertical). The patterned columns denote months when events (e.g. staff meetings at each institution and within each professional discipline) targeted to improve adherence occurred. The * denotes ≥ 5% increase in adherence during the month following the event. The – denotes the level of the ≥ 5% increase in adherence to see if the improvement in adherence was maintained up to 2 months after the event.

Table 1: Clinician characteristics and average time to complete standardized assessment battery

Setting	**Years Experience**	**Mean Annual Turnover**	
Acute Hospital	<1-35	10%	
IRF	<1-35	5%	
Outpatient Facility	2-31	5%	
Time (mean minutes)	**PT**	**OT**	**SLP**
Acute Hospital	20	39	40
IRF	50	90	52
Outpatient Facility	52	46	45

IRF = Inpatient Rehabilitation Facility

PT: Physical Therapy

OT: Occupational Therapy

SLP: Speech-Language Pathology

*Average time is based on random observation of assessments conducted each month at each facility.

Table 2: Sample characteristics, Mean (SD) or %

	Acute (n= 2083)	IRF (n= 397)	Outpatient (n= 155)
Age at stroke, year	63 (15)	62 (13)	57 (12)
Gender			
Women	52%	50%	46%
Men	48%	50%	54%
Race			
African American	39%	61%	55%
Caucasian	58%	37%	25%
Asian	1%	1%	1%
Other/missing	2%	1%	19%
First Stroke	70%	66%	58%
Days, Median (IQ)			
Stroke to- Acute Assessment	0 (0)		
Stroke to- IRF Assessment	5 (7)		
***Stroke to- Outpatient Assessment**	57 (91)		

IRF = Inpatient Rehabilitation Facility

*Stroke to Outpatient Assessment includes the combination of participants with new strokes as well as patients with more chronic stroke-related disabilities

Table 3: Percent adherence across setting and discipline (top) and time (bottom). Values are median (IQ).

Setting	**PT**	**OT**	**SLP**	Median Across Setting (IQ)
Acute facility	0.86 (0.82-0.91)	0.88 (0.81-0.93)	0.80 (0.61-0.85)	0.84 (0.73-0.88)
IRF	0.88 (0.82-0.92)	0.76 (0.71-0.79)	0.79 (0.69-0.84)	0.80 (0.76-0.83)
Outpatient facility	0.73 (0.69-0.82)	0.60 (0.53-0.68)	0.52 (0.38-0.64)	0.60 (0.55-0.71) †
Median Across Discipline (IQ)	0.84 (0.80-0.85)*	0.74 (0.71-0.76)*	0.68 (0.62-0.74)*	
Assessment Time				Median Across Time (IQ)
IRF Admission	0.94 (0.89-0.97)	0.79 (0.74-0.85)	0.79 (0.69-0.86)	0.85 (0.79-0.88)
IRF Discharge	0.82 (0.71-0.88)	0.65 (0.58-0.68)	0.76 (0.71-0.87)	0.74 (0.67-0.82) ‡
Outpatient Admission	0.92 (0.88-0.96)	0.78 (0.62-0.81)	0.71 (0.63-0.81)	0.78 (0.65-0.84)
Outpatient Monthly	0.65 (0.56-0.78)	0.38 (0.23-0.49)	0.29 (0.20-0.41)	0.46 (0.35-0.54) ‡

IRF = Inpatient Rehabilitation Facility

*Significance across discipline: PT and OT ($p < .001$), PT and SLP ($p < .001$), and OT and SLP ($p = .004$).

†Significance across setting: Acute facility and Outpatient facility ($p < .001$) and IRF and Outpatient facility ($p = .001$).

‡Significance across assessment time: IRF Admission and IRF Discharge ($p = .002$), Outpatient Admission and Outpatient Monthly ($p < .001$), and IRF Discharge and Outpatient Monthly ($p < .001$).

Appendix 1 (Supplementary): Brain Recovery Core standardized assessment battery

Motor Domain

Minimal Battery Requirement
- Motricity Index*†‡
- Modified Ashworth Scale (elbow & ankle) †‡
- Somatosensation (palm & foot) *†‡
- Berg Balance Scale*†‡
- 10m Walk Test*†‡
- 6 Minute Walk Test†‡
- FIM Items*†‡

Cognitive Domain

Minimal Battery Requirement
- Short Blessed Test *†‡
- Unstructured Mesulam Cancellation*†‡
- Catherine Bergego Scale†
- BIT Article Reading†‡
- Trail-Making Test*†
- Executive Function Performance Test (bill paying) **or** Performance Assessment of Self-Care Skills (one subtest) ‡
- Canadian Occupational Performance Measure (three goals) ‡
- FIM Items*†‡

If Pass SBT →
- Rey Auditory Verbal Learning*†‡
- W-J Retrieval Fluency Test*†‡
- W-J Spatial Relations Test*†‡
- W-J Numbers Reversed Test*†‡

Language Domain

Minimal Battery Requirement
- Boston Naming Test *†‡
- Limb Apraxia Screen*
- Mann Assessment of Swallowing Ability*†‡
- FIM Items†

If Fail BNT → Western Aphasia Battery*†‡ → If Fail WAB →
- BDAE Aesop's Discourse Production Probe†‡
- Discourse Comprehension Test†‡
- Communication Effectiveness Index†‡

*Assessment administered at the acute facility
†Assessment administered at IRF
‡Assessment administered at outpatient facility

BDAE = Boston Diagnostic Aphasia Evaluation
BIT = Behavioral Inattention Test
BNT = Boston Naming Test
FIM = Functional Independence Measure
SBT = Short Blessed Test
WAB = Western Aphasia Battery
W-J = Woodcock-Johnson Test

As participants travel from the acute facility, IRF, and outpatient facility the standardized assessments vary to reflect patient needs at different stages across the post-stroke rehabilitation continuum.