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

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2

3 **Title:** Clinician adherence to a standardized assessment battery across settings and disciplines in a post-
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23

24

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29

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43 **Abstract**

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

48 **Design:** Retrospective cohort study

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

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

52 **Interventions:** N/A

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

56 **Results:** Median adherence ranged from 0.52 to 0.88 across all settings and professional disciplines.

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

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

65 **Key Words:** assessment, adherence, rehabilitation

66 **Abbreviations:**

67 IRF: Inpatient Rehabilitation Facility

68 PT: Physical Therapy

69 OT: Occupational Therapy

70 SLP: Speech-Language Pathology

71

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

77 In a survey of 1,000 physical therapists (PT), it was found that use of standardized measures
78 across different patient conditions and practice settings was not part of routine clinical practice.¹ In a
79 separate study, the majority of surveyed speech language pathologists (SLP) describe using their own or
80 non-standardized/informal assessments to assess communication deficits in patients post-stroke.⁹
81 Despite mandated standardized measures, some groups report that 92% have never used the scores in
82 their clinical practice (e.g. diagnostic evaluation, treatment planning or monitoring).⁶ Rehabilitation
83 professionals (occupational therapists (OT), PT, nursing) have identified many challenges such as
84 organizational policy and procedures, clinician competence and beliefs, and the measurement itself
85 (pieces of equipment, time to administer) as barriers to the implementation of standardized
86 assessments into everyday clinical practice.^{7, 11-14} Literature examining how to implement change within
87 the healthcare system has shown that targeted, prospective efforts are more likely to improve
88 professional practice¹⁵ and that specific strategies such as audit and feedback or educational meetings
89 can be useful as well.¹⁶⁻¹⁹

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

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

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

104

105 **Methods**

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

118 assessments are conditional based on participant results on brief screening measures. For example, the
119 15-item Boston Naming Test²² is used as a screen for possible aphasia. If a participant fails the Boston
120 Naming test, they are then given the Western Aphasia Battery²³ to determine if aphasia is present, and if
121 so subsequent aphasia measures are administered. However, if the participant passes the Boston
122 Naming Test screen than none of the subsequent aphasia measures are administered, thus the
123 evaluation would take less time. The time to complete assessments mirrors the time given at each
124 setting for an evaluation and are presented in Table 1. Rehabilitation data (assessment scores) are
125 stored from participants across all three settings (acute hospital, IRF, outpatient facility) and
126 professional disciplines (PT, OT, SLP). All participants entered into the database have a primary stroke
127 diagnosis, have received standard rehabilitation services as prescribed by licensed clinicians at each
128 facility and have provided informed consent to have their stroke rehabilitation data stored and used for
129 research. Washington University Human Research Protection Office has approved the database and
130 studies using de-identified data.

131 The acute hospital setting assessments are completed once a patient is stabilized and
132 rehabilitation services are ordered, usually within 24 hours of admission. The IRF setting assessments
133 are completed within 48-72 hours of admission and discharge. The outpatient setting assessments are
134 completed at admission (first 1-2 visits) and then on a monthly basis. All assessments are administered
135 by licensed clinicians who have been trained on these assessments, complete annual competencies on
136 them, and who are observed for consistency. Each month, clinician-specific and measure-specific
137 feedback on adherence (defined as all measures completed at their specific time point) were extracted
138 from the database and provided to the clinician managers. Managers used policies and procedures
139 already in place at each setting to disseminate feedback to staff clinicians. Various events (e.g. staff
140 meetings at each setting and within each professional discipline) were held periodically throughout the
141 17 month time period. Events typically included: presentation of previous monthly adherence,

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

144

145 *Statistical Analysis*

146 SPSS version 19 (IBM Corporation; Armonk, New York) was used for all statistical analyses and
147 the criterion for statistical significance was set at $p < 0.05$. In this analysis, the data of interest (individual
148 unit in the analysis) is the assessment by a clinician of an individual participant at a specific time point
149 along the rehabilitation continuum. Each assessment is required to be completed 100% of the time,
150 regardless of whether or not it was completed at other settings or in other disciplines. The same
151 participants were evaluated at more than one facility and by more than one discipline at each facility
152 with less than 5% of participants seen for only one evaluation at only one facility. Likewise, each clinician
153 performed assessments on multiple participants over the 17 month time period. Data were aggregated
154 across individual assessments and not across individual participants or individual clinicians. Non-
155 parametric analyses were selected because of violations in the normality assumption. A Friedman two-
156 way analysis of variance by ranks was used to determine if adherence to the Brain Recovery Core
157 assessment battery differed across settings and professional disciplines. Settings (acute hospital, IRF,
158 outpatient facility) and professional disciplines (PT, OT, SLP) were considered within group factors for
159 this analysis. For significant results, a Wilcoxon Signed-Ranks test with Bonferroni's Correction ($p <$
160 0.008) was performed post-hoc. A similar analysis was repeated to compare if adherence to the
161 assessment battery varied based on when the assessment was administered at the IRF (admission,
162 discharge) and outpatient (admission, monthly) settings (Bonferroni's Correction ($p < 0.013$)). Percent
163 adherence was then plotted and visual inspection of time-series data was conducted to see if events
164 increased adherence $\geq 5\%$ and if so, how long the increase in adherence lasted. An improvement equal

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

168

169 **Results**

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

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

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

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

210 system was found.⁸ In that project, an electronic medical record system was built utilizing the defined
211 measures that clinicians were expected to complete. Here in the BRC, the acute hospital is the only
212 setting with an electronic medical record. This may, in part, explain why a higher level of adherence was
213 seen in the acute setting when compared to the outpatient facility. In addition, it is noted that the
214 clinician turnover rate is twice as high in the acute setting, yet they have significantly higher adherence
215 than the outpatient facility. These findings in addition to a third survey¹⁰, are in sharp contrast with self-
216 report data indicating that outpatient therapists are four times more likely than acute therapists and 10
217 times more likely than inpatient rehabilitation therapists to use standardized outcome measures.¹

218 Audit and feedback techniques have been shown to improve clinical practice through increasing
219 adherence to clinical guidelines.¹⁶⁻¹⁸ Monthly audits of missing data were conducted throughout the 17
220 month period with the information disseminated back to the clinicians. Despite this process, no trend or
221 steady improvement over time was detected across setting or professional discipline. Structured events,
222 which have been shown to improve clinical practice¹⁹, were held, but were followed by improved
223 adherence the following month only 40% of the time. Since the increased adherence was sustained for
224 an additional month 60% of the time, we were only effective in increasing longer-term adherence 24%
225 (6/25) of the time an event was held. Collectively, these numbers indicate that sustainability of uniform
226 standardized assessment use in clinical practice is complex. Using implementation and sustainability
227 methods suggested by the healthcare implementation literature had only small influences on
228 adherence. New methods for promoting adherence and sustaining adherence clearly need to be
229 developed.

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

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

245

246 *Study Limitations*

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

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

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

266

267 **Conclusions**

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

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Figure 1

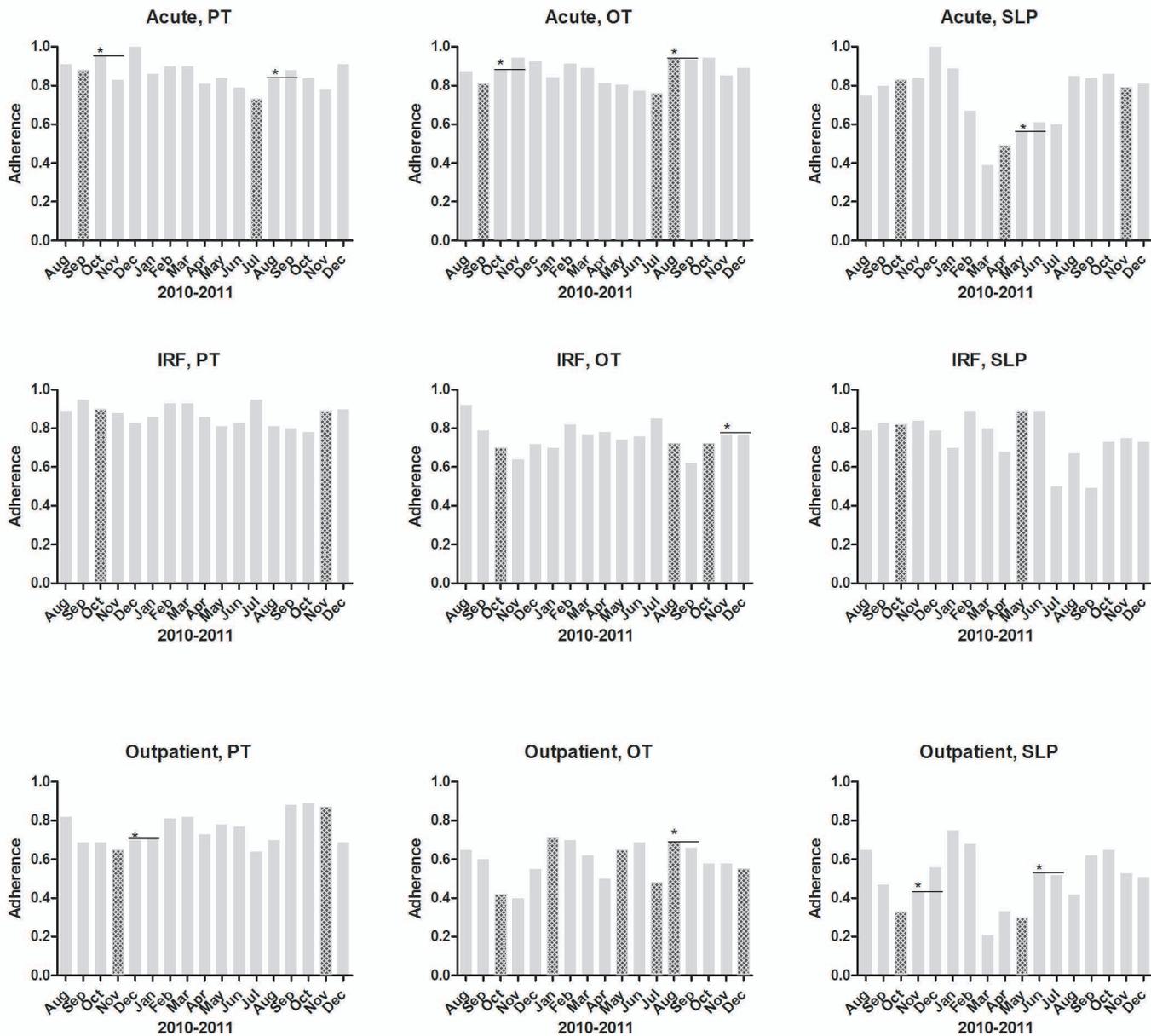


Figure Legends

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 $\geq 5\%$ increase in adherence during the month following the event. The – denotes the level of the $\geq 5\%$ 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.