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DRAFT

**Predicting home discharge after inpatient rehabilitation of stroke patients with aphasia**

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1 **PREDICTING HOME DISCHARGE AFTER INPATIENT REHABILITATION OF STROKE**  
2 **PATIENTS WITH APHASIA**

3  
4 **Abstract**

5 The early identification of the discharge setting from Inpatient Rehabilitation Facilities (IRFs) is a primary  
6 goal in stroke-related research because of its clinical and socio-economic relevance. Several features have  
7 been identified as significant predictors of the discharge setting. Within cognitive deficits, aphasia is known  
8 to be a common and disabling condition that could influence rehabilitation outcome. However, it is often set  
9 as an exclusion criterion in stroke research.

10 This study aims to investigate the predictive power of clinical variables, in particular specific language  
11 disturbances and nonlinguistic cognitive deficits, for discharge setting in post-acute stroke patients with  
12 aphasia after intensive multidisciplinary rehabilitation.

13 In a sample of 158 patients, demographic, motor, language and nonverbal cognitive data were retrospectively  
14 considered for the prediction of the discharge to home versus to other institutional setting. Univariate  
15 analysis identified relevant differences between groups and the significant variables were included in a  
16 logistic regression model. The results showed that better functional motor status, absence of dysphagia and  
17 unimpaired nonlinguistic cognitive profile independently predict the discharge to home. In particular,  
18 nonverbal cognitive functioning seemed to be specifically relevant within the aphasic population.  
19 The findings could be helpful for setting up the rehabilitation priorities and an adequate discharge  
20 arrangement.

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23 **Keywords:** aphasia, stroke, discharge setting, cognitive deficit, rehabilitation outcome.

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25  
26 **Introduction**

27 Stroke is a major cause of disability worldwide and its prevalence is expected to increase<sup>1</sup>. After acute care,  
28 inpatient rehabilitation facilities (IRFs) admit stroke survivors who require rehabilitation to reduce their  
29 degree of disability. The clinical decision for the discharge setting from IRFs is primarily based on the  
30 complexity of clinical needs and on the level of independency patients reached during the rehabilitation  
31 pathway<sup>2</sup>. The early identification of the discharge setting is a major goal for the clinicians because it allows  
32 to set the priorities of the intervention and to plan promptly adequate post-discharge social support systems.  
33 Several factors have been investigated as potential predictors of discharge destination after IRF  
34 hospitalization of stroke patients. As suggested by previous studies<sup>3-6</sup>, younger age seems to be associated  
35 with increased odds of being discharged home. Moreover, functional status<sup>3,7-9</sup> and balance<sup>10,11</sup> have been  
36 reported as clinical determinants for discharge setting after rehabilitation in multiple studies. The presence of  
37 dysphagia has been highlighted as an independent factor as well<sup>4,11</sup>. Other studies have focused on the role of

1 living arrangement or the premorbid social support, as the civil status, the presence of a caregiver or of a  
2 support network<sup>3-5,7,10,12</sup>. Medicare health insurance or type of healthcare coverage seem to be relevant  
3 across countries that do not provide for full national coverage<sup>4</sup>.

4 Cognitive phenotype is a crucial factor strongly associated with rehabilitation outcome and discharge  
5 setting<sup>4,6,12</sup>. Within cognitive deficits following stroke, aphasia is a common and disabling condition: it  
6 affects up to 43%<sup>13</sup> of older patients and it is associated with higher mortality<sup>14,15</sup>, inpatient complications<sup>16</sup>,  
7 higher short- and long-term disability<sup>16-19</sup>, longer hospitalization and higher rates of readmission<sup>14,16,17</sup>. A  
8 growing amount of studies highlighted that nonlinguistic cognitive impairments in aphasic patients are  
9 frequent and heterogeneous<sup>20-22</sup>. They may worsen aphasia symptoms<sup>22</sup> and influence the efficacy of aphasia  
10 rehabilitation and language recovery<sup>22-25</sup>. These results support the importance to detect and evaluate the  
11 severity of nonlinguistic cognitive deficits through clinical investigation and specific psychometric tests in  
12 patients with aphasia due to stroke.

13 Despite those evidences, the role of nonlinguistic cognitive deficit in aphasic patients on functional recovery  
14 has been poorly investigated, since, possibly, the language impairment challenges the feasibility and the  
15 reliability of the other cognitive domain's assessment. Aphasic patients are often unable to undergo a  
16 complete evaluation, as many neuropsychological tests used to identify possible cognitive impairments  
17 require verbal comprehension and/or oral production abilities<sup>26</sup>. As a result, people with aphasia are often  
18 excluded from stroke research<sup>27</sup>. Only one study<sup>28</sup> on a sample of aphasic patients investigated the role of  
19 nonlinguistic cognitive impairments of aphasic patients on functional outcome after rehabilitation: results  
20 indicated a clear association between cognitive impairment and poor functional outcome. To the best of our  
21 knowledge, the role of nonlinguistic cognitive impairments of aphasic patients on discharge setting after  
22 rehabilitation has not yet been explored within a population of aphasic patients. A recent systematic review  
23 investigating the results of non-invasive brain stimulation, such as transcranial Direct Current Stimulation  
24 (tDCS), suggested that further study should be undertaken on the relationship between language/aphasia and  
25 cognition, and improved cognitive assessments for patients with aphasia may be developed<sup>29</sup>.

26 The aim of this study is to investigate the role of clinical variables, in particular specific language  
27 disturbances and nonlinguistic cognitive deficits, in the prediction of discharge setting from IRF in a large  
28 cohort of post-acute left-hemispheric stroke patients with aphasia who underwent an intensive and  
29 multidisciplinary rehabilitation treatment.

### 31 **Patients and Methods**

32 Performing a text search in the electronic data system of our IRF, a sample of 158 patients, who were  
33 consecutively admitted from January 2010 to December 2018, was identified. Inclusion criteria were: (a)  
34 presence of aphasia, (b) post-acute phase (Time Post Onset, TPO between 3 and 180 days), (c) native Italian  
35 speaker and (d) right-handed. Patients with a history of dementia and/or psychiatric illness, severe sensory  
36 deficits, consciousness disorders and clinical conditions not allowing the assessment or the rehabilitation

1 treatment were excluded. The study was conducted in accordance with the Declaration of Helsinki and was  
2 approved by the Local Ethics Committee (Milano Area B: Resolution 378\_2018, ID 68101).

3 Demographic and clinical data of our sample were collected and included age (years), gender, education  
4 (according to Italian school system), premorbid functional independence (Y/N), premorbid living  
5 arrangement (alone/family/attendant), first ever stroke (Y/N), type of stroke (ischemic/hemorrhagic), TPO  
6 (days) and presence of dysphagia (Y/N). The presence of dysphagia was tested at admission and discharge  
7 by a qualified speech therapist through Clinical Swallowing Evaluation (CSE)<sup>30</sup>, i.e., oral movement  
8 evaluation and swallowing tests with different consistencies. According to CSE, the patients in need of tube  
9 feeding or semisolid diet were qualified as dysphagic. Functional status was assessed by a physiatrist at  
10 admission and discharge through the Functional Independence Measure (FIM)<sup>31</sup>, a 18-items clinician-  
11 reported scale. The score for global functional independence (total FIM, T-FIM) ranges from 18 to 126,  
12 while the score for motor impairment (motor FIM, M-FIM) ranges from 13 to 91; a higher score corresponds  
13 to a higher independence level. The amount of rehabilitation treatment was calculated in terms of total  
14 number of one-to-one sessions for each type of intervention. Physiotherapy (PhT) was usually undertaken  
15 twice a day, while speech and language therapy (SpT) and occupational therapy (OcT) were administered  
16 according to medical prescription, usually 2 to 5 times per week. Each session lasted 45 minutes in average.  
17 The total length of stay (LOS, days) in the IRF was also calculated. The standard LOS according to the  
18 regional diagnosis-related group (DRG) based hospitalization system is set at 60 days for this specific  
19 population.

20 Regarding cognitive assessment, three domains were analyzed: language, nonverbal reasoning, and spatial  
21 cognition. An in-depth assessment of language was performed through Aachen Aphasia Test (AAT)<sup>32,33</sup>  
22 both at admission and discharge. AAT consists of five subtests specific for different linguistic abilities: i)  
23 Token test, including comprehension of verbal commands; ii) repetition of phonemes, words and sentences;  
24 iii) written language, including reading and writing; iv) naming of objects, colors and pictures' description  
25 and v) comprehension of oral and written words and sentences. All data were reported in normalized scores.  
26 For each AAT subtest, a score between 20 and 42 indicates a severe impairment, between 43 and 52 a  
27 moderate and from 53 and 80 a mild one. The analysis of the normalized scores in the five subtests provided  
28 an average level of linguistic performance (H-index); a greater H-index score corresponds to a better  
29 performance and, consequently, to a less severe language impairment.

30 Colored Raven's Matrices Test (CPM)<sup>34</sup> was administered to evaluate pure nonverbal reasoning abilities.  
31 This culture-free test is particularly appropriate for aphasic patients, since it evaluates abstract reasoning  
32 through visual items requiring neither language involvement nor declarative knowledge. Past research  
33 consistently revealed good psychometric properties for this test<sup>35</sup>.

34 The assessment of unilateral spatial neglect (USN) was performed using lines<sup>36</sup> and bells<sup>37</sup> cancellation tests.  
35 The omission in the contralesional space of  $\geq 2$  lines or  $\geq 5$  bells was considered as indicative of the presence  
36 of right-USN.

1 Discharge setting was set as the outcome measure. All patients had a clear discharge location, therefore they  
2 were classified in two groups, defined as home vs. institutional setting (IS).

### 3 *Statistical analyses*

4 IBM SPSS Statistics® software (version 25.0) was used to perform all statistical analyses. Descriptive data  
5 were displayed as mean and SD or absolute number and frequency. Possible associations among the  
6 continuous variables were investigated with the Pearson correlation coefficient. In order to identify  
7 significant differences between home and IS groups, the Pearson's  $\chi^2$  test was used for categorical variables,  
8 while Student's t test was adopted for continuous variables. The predictive power of the independent  
9 variables associated with a higher probability to be discharged home was investigated with a logistic  
10 regression model. The potentially predictive variables in the logistic model were selected considering clinical  
11 plausibility, significant differences highlighted by univariate analysis, and after verifying linearity and  
12 multicollinearity assumptions. Adjusted odds ratios (OR) and 95% confidence intervals (CI 95%) were used  
13 as measures of effect. The statistical significance was set at  $p < 0.05$ .

14

### 15 **Results**

16 Overall, 158 aphasic patients (80 male and 78 female) took part in the study. Patients had a mean age of 73.2  
17  $\pm 10.9$  years and an average number of years of formal education of  $9.7 \pm 4.4$ . They were admitted to the IRF  
18 between 4 and 178 days after stroke and the mean length of hospitalization was  $57.5 \pm 18.6$  days. Most of the  
19 subjects have experienced a first-ever stroke at the time of the enrollment (77.2%) and were functionally  
20 independent before the event (78.4%). Fifty-one patients (32.3%) presented with dysphagia at admission.  
21 Initial mean M-FIM score was  $40.7 \pm 20.5$  while mean T-FIM score was  $61.1 \pm 26.0$ . Regarding language,  
22 admission mean AAT scores were  $45.5 \pm 12.8$  for Token test,  $50.3 \pm 14.3$  for repetition,  $49.3 \pm 12.1$  for written  
23 language,  $49.9 \pm 13.6$  for naming and  $45.7 \pm 13.0$  for comprehension. Fifty-one (32.3%) patients showed  
24 impaired pure nonverbal reasoning abilities and nine (5.7%) had right-sided USN. Considering the overall  
25 sample no significant correlation was found between age and other continuous variables ( $p > 0.05$ ). A  
26 moderate negative correlation was identified between LOS and M-FIM ( $r = -0.445$ ,  $p < 0.01$ ); while a weak  
27 negative correlations were found between LOS and AAT subtests scores ( $-0.306 < r < -0.212$ ,  $p < 0.01$ ). M-FIM  
28 showed weak to moderate positive correlations with AAT subtest scores ( $0.207 < r < 0.430$ ,  $p < 0.01$ ). Finally  
29 among AAT subtests scores moderate to strong correlation were identified ( $0.593 < r < 0.743$ ,  $p < 0.01$ ).

30

### 31 *Discharged home vs. to IS: univariate analysis at admission evaluation*

32 **Table 1** shows demographic, clinical and functional characteristics of the two groups of patients (home vs.  
33 IS). Within the sample, 92 patients (58.2%) were discharged home while 66 (41.8%) to an institutional  
34 setting. Univariate analysis showed that age, gender, education, premorbid autonomy, first ever stroke, ictus  
35 type and TPO did not differ within groups. Otherwise, M-FIM and T-FIM mean scores at admission were  
36 significantly higher (both  $p < 0.001$ ) in patients who were discharged home than those of patients who were  
37 discharged to other institutions. Moreover, there were significantly more patients with dysphagia ( $p < 0.001$ )

1 within the IS group (57.6%) compared to the discharged home group (14.1%). Patients who were discharged  
2 to IS were hospitalized for a longer period than those discharged home, and consequently they underwent a  
3 greater number of sessions of physical and speech and language therapy (all  $p < 0.001$ ). Average LOS for  
4 home discharged group was in line with standard DRG-based hospitalization time while patients discharged  
5 to other institutions presented a longer stay in the IRF. Regarding cognitive domain (**Table 2**), in the IS  
6 group the aphasic disorder at admission was significantly more severe (H index;  $p = 0.003$ ) corresponding to  
7 worse performances in all AAT subtests (i.e., Token test:  $p = 0.007$ ; repetition:  $p = 0.015$ ; written language:  
8  $p = 0.003$ ; naming:  $p = 0.003$ ; comprehension:  $p < 0.001$ ). Moreover, CPM differed significantly among groups  
9 ( $p < 0.001$ ): there were more patients with unimpaired pure nonverbal reasoning abilities within the  
10 discharged home group (78.3%) compared to the IS one (53.0%). No significant differences regarding the  
11 presence of right-sided USN ( $p = 0.867$ ) were found between the two groups.

### 13 *Longitudinal analysis and evaluations at discharge point*

14 Analyzing longitudinally data at admission and at discharge it can be noted that both IS and home groups  
15 showed a significant improvement in M-FIM, T-FIM, H-index and AAT subtests scores and regarding the  
16 prevalence of dysphagia (all  $p < 0.001$ ). However, comparing performances at discharge point (**Table 3**), it  
17 can be underlined that scores in all the above-mentioned tests were significantly higher in the discharged  
18 home group than in the IS one (all  $p < 0.001$ ). Regarding dysphagia, in the discharged home group, the  
19 prevalence of this impairment was significantly lower when compared with the IS group ( $p < 0.001$ ).  
20 Furthermore, just four patients of our sample were discharged with a tube-feeding device, all of them were  
21 sent to an IS, none at home. Information concerning USN and CPM were not available due to missing data at  
22 discharge point for this area of assessment.

### 24 *Predictors of the discharge home setting*

25 Two logistic regression models were performed to analyze the predictive power of the independent variables  
26 classified as clinically relevant and statistically significant in the univariate analysis. LOS was not included  
27 in both models due to the violation of the linearity assumption. Motor FIM, dysphagia, CPM and language  
28 assessment were included as potential predictors, while age and gender and LOS were considered as  
29 adjustment covariates. H-index and AAT subtests were not included in the same predictive model to avoid  
30 the collinearity bias, since the first measure is derived from the others. No collinearity among the other  
31 continue variables has been found (tolerance  $> 0.1$ ; VIF  $< 10$ ). In the first regression model the global severity  
32 of aphasia (i.e., H-index, data not presented) was considered, while in the second one all AAT subtests were  
33 included (data presented in **Table 4**). Outcomes between the two models were largely comparable: admission  
34 M-FIM, dysphagia and pure nonverbal reasoning abilities independently predicted discharge setting in both  
35 models. Aphasia general severity and specific linguistic performances were not found to be predictive for  
36 discharge setting, either considering the mean degree of impairment (H-index) or single language abilities  
37 (AAT subtests) independently.



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**Discussion**

The presence and the characteristics of cognitive impairment of stroke patients in IRF is clinically relevant for both setting up early rehabilitation and planning discharge destination. Cognitive phenotype following left-hemispheric stroke could be very heterogeneous, especially due to the multifaceted feature of language disorders and to the co-occurrence of nonlinguistic cognitive impairments. It should be highlighted that addressing this topic is problematic since people with aphasia are frequently excluded from stroke research for several reasons<sup>28</sup>. In particular, the neuropsychological assessment and the patients' participation to structured activities might be limited due to the linguistic impairment. Besides, aphasic patients are limited in express their consent to participate knowingly to research projects. Therefore, the aim of the present study focused on determining the role of different language impairments and nonlinguistic cognitive deficits, alongside other clinical features, in the prediction of discharge setting of post-acute stroke aphasic patients after an intensive and multidisciplinary rehabilitation.

*Linguistic impairment*

Language assessment revealed that patients discharged home showed a significant less severe aphasia at admission than those discharged to institutional care. This result emerged for all the different language abilities considered and in terms of global severity (i.e., Token test, repetition, written language, naming, comprehension and H index). Nevertheless, from the multivariate analysis, neither general severity nor any specific language features were found to be independent predictors of discharge setting. A possible explanation for this finding could be related to the subtle social impact of aphasia in the post-acute phase, which might reduce the weight of this condition in determining the discharge arrangements. Unlike motor functioning and dysphagia, the disruptive effects of communication disturbances on daily living activities, social participation, interpersonal relationship and psychological well-being tend to be exacerbated in the chronic phase<sup>38-40</sup>. Another possible explanation for this finding could be related to the regression model. As a matter of fact, the multivariate analysis considered several independent variables, including pure nonverbal reasoning, that could cover the predictive power of linguistic deficits.

*Nonlinguistic cognitive impairment*

The results of the present study highlighted that patients with intact nonlinguistic cognitive abilities have a higher probability of being discharged home compared to those who present an impairment in this domain. The role of nonlinguistic cognitive abilities in aphasic patients have been poorly investigated, possibly due to the above-mentioned clinical evaluation<sup>28</sup> and research recruitment<sup>27</sup> difficulties. For this reason, the possible interaction between aphasia and other cognitive deficits is still debated. In a recent work, Fonseca and colleagues<sup>25</sup> identified nonverbal reasoning as the only nonlinguistic cognitive feature able to predict independently aphasia recovery. Furthermore, this cognitive domain was found to be close to statistical

1 significance for the prediction of motor recovery in a group of aphasic patients after rehabilitation<sup>41</sup>.  
2 Different explanations for the influence of nonverbal reasoning on discharge setting, aphasia recovery and  
3 functional motor outcome could be proposed<sup>25</sup>. Firstly, nonlinguistic cognitive abilities are necessary for the  
4 patient to be involved during training session and to pursue therapy goals, leading to a higher chance to be  
5 discharged home. Moreover, these functions could support the use of different strategies to cope with  
6 environmental demands and with the completion of daily living activities. Finally, it has been hypothesized  
7 that reasoning abilities could be an indirect measure of cognitive reserve. Higher cognitive resources could  
8 provide better performances regardless of lesion severity through the activation of alternative functional  
9 networks. Notably, reasoning abilities represent only one of the multifaceted cognitive functions that can be  
10 selectively impaired following stroke<sup>21,22</sup>. Further works are needed to investigate whether specific executive  
11 abilities (i.e., shifting, inhibition, and updating abilities) affect functional, motor and cognitive outcomes of  
12 patients with aphasia due to stroke. In accordance with our findings, some authors<sup>21,22</sup> stated for an  
13 interdependency between general cognitive functioning and linguistic abilities in specific aphasic  
14 populations. Conversely, others studies<sup>42,43</sup> did not support such hypothesis and highlighted the mutual  
15 independence between these two domains considering both clinical performances and neuroimaging. As a  
16 novelty of this research, it can be supposed that the association between nonlinguistic cognitive impairment  
17 and aphasia is a better predictor of discharge setting than aphasia severity itself. Left-sided USN in right-  
18 hemisphere stroke patients have been previously identified as a clinical determinant of rehabilitation  
19 outcome<sup>44,45</sup>. In our sample, the prevalence of unilateral spatial neglect did not significantly differ between  
20 the two groups considered, suggesting that right-sided USN seems might not to be as relevant as left-sided  
21 one. A possible explanation of this finding could be that right-sided USN is usually less severe than left-  
22 sided USN<sup>46</sup>. Moreover, it can be supposed that no significant effect of USN could depend on the small  
23 number of subjects with this impairment in our population (5.7%).

#### 24 *Motor and swallowing impairment*

25 As highlighted in the results, besides cognitive features, functional motor status and dysphagia were  
26 identified as independent predictors of the discharge setting. The role of admission motor/functional status  
27 on discharge destination from IRF has been already emphasized by several studies<sup>3,41,47-49</sup> regarding stroke  
28 patients, without a specific focus on aphasia and language disturbances. These studies suggest that patients  
29 with a severe functional impairment are less likely to be discharged home especially when in absence of a  
30 suitable social support. Our results confirm these findings to be still appropriate within aphasic population. In  
31 addition, the longer hospitalization of the patients discharged to IS could be interpreted in light of their more  
32 severe condition, which might require prolonged assistance and medical care. Furthermore, the examined  
33 literature<sup>50</sup> identifies dysphagia as a common impairment following stroke. Swallowing problems after stroke  
34 rates up to 65% and may induce hydration and nutritional difficulties, a wide range of in-hospital  
35 complications and a lower gain from rehabilitation treatments. Arnold and colleagues<sup>51</sup> reported that in a  
36 large sample of stroke patients dysphagia was associated with a lower probability to live at home either at  
37

1 discharge from hospital or after three months. The results of the present study agree with the literature, since  
2 about one-third of the sample presented dysphagia at admission and this impairment was the most relevant  
3 clinical characteristic in predicting the discharge destination. Possible explanations for this finding may  
4 include the high risk of clinical complications associated with dysphagia and the difficulties of managing a  
5 modified diet or an enteral feeding device at home<sup>50</sup>. The reported results regarding dysphagia evaluation at  
6 discharge support this hypothesis. In fact, only 2.2% of the discharged home group showed a persistent  
7 dysphagia requiring a modified diet and no subject in the same group manifested the necessity of tube  
8 feeding at discharge. Similar findings have been already described in previous studies<sup>6,52</sup> and seem to be  
9 confirmed for aphasic patients too.

10  
11 This study presents some limitations. Despite the fairly large sample, the study was conducted in a single  
12 setting, limiting the generalizability of the results. Moreover, due to the retrospective nature of the study,  
13 some variables known to impact IRF discharge were not available for the recruited population (e.g.,  
14 comorbidities, index of stroke severity, extent of the lesion, depression, socio-economic condition). For the  
15 same reason, in this study only the presence/absence of nonverbal reasoning impairment and USN were  
16 considered among nonlinguistic cognitive abilities. Future work should include a thorough evaluation of the  
17 cognitive domain, with different tools designed for specific abilities (e.g., attention and executive function),  
18 to identify the possible influence of selective impairment on rehabilitation outcome. Furthermore, a  
19 comparison between homogeneous populations of aphasic and non-aphasic poststroke patients on this matter  
20 could highlight specific findings for people with aphasia. Finally, it would be interesting to analyze, with a  
21 long-term follow-up, the evolution of the discharge arrangement in terms of further rehabilitation  
22 admissions, relocation in a nursing home or introduction of a home assistant.

23

## 24 **Conclusions**

25 Interdisciplinary complex stroke rehabilitation is one of the fastest growing fields in stroke research. This  
26 study attempts to better characterize the determinants of one crucial rehabilitation outcome (i.e., discharge  
27 destination from IRF) in a large cohort of post-acute stroke aphasic patients who are often neglected by  
28 researches. The displayed results highlighted the preeminent role of nonlinguistic cognitive deficit in  
29 predicting the discharge setting within this specific population. This data account for the importance of an  
30 adequate assessment of nonverbal neuropsychological profile of aphasic patients admitted in IRFs.  
31 Furthermore, the predictive power of functional motor status and especially dysphagia was confirmed to be  
32 significant. These findings could be clinically helpful for an early identification of the discharge destination  
33 and for setting up commensurate rehabilitation goals.

34

## 35 **Statement of Ethics**

1 All research procedures were conducted ethically in accordance with the World Medical Association  
2 Declaration of Helsinki. All research procedures were approved by the Local Ethics Committee (Milan Area  
3 B: Resolution 378\_2018, ID 68101).

4

#### 5 **Disclosure Statement**

6 The authors report no conflict of interest.

7

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10

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1 **Tables**

2

3 **Table 1.** Demographic, clinical and functional characteristics by discharge location (home vs. institutional  
4 setting, IS). Continuous variables are reported as mean (SD; range min-max), categorical as N (%).

5

	<b>Home</b> N=92 (58.2%)	<b>IS</b> N=66 (41.8%)	Test
Age	73.8 (±9.5; 48-89)	72.2 (±12.7; 34-91)	t=0.879 p=0.381
Gender	<i>Male</i> 47 (51.1%) <i>Female</i> 45 (48.9%)	33 (50.0%) 33 (50.0%)	$\chi^2=0.018$ p=0.893
Education*	<i>Primary school</i> 24 (28.9%) <i>Middle school</i> 21 (25.3%) <i>High school</i> 35 (42.2%) <i>University</i> 3 (3.6%)	23 (39.0%) 19 (32.2%) 14 (23.7%) 3 (5.1%)	$\chi^2=5.214$ p=0.157
Premorbid autonomy	<i>Independent</i> 69 (77.5%) <i>Dependent</i> 20 (22.5%)	55 (85.9%) 9 (14.1%)	$\chi^2=1.714$ p=0.190
Premorbid living arrangements	<i>Alone</i> 29 (56.9%) <i>Family</i> 59 (65.6%) <i>Attendant</i> 2 (2.2%)	22 (33.8%) 42 (64.6%) 1 (1.5%)	$\chi^2=0.127$ p=0.939
First ever stroke	<i>Yes</i> 69 (75.0%) <i>No</i> 23 (25%)	53 (80.3%) 13 (19.7%)	$\chi^2=0.614$ p=0.433
Ictus Type	<i>Ischemic</i> 72 (78.3%) <i>Hemorrhagic</i> 20 (21.7%)	45 (68.2%) 21 (31.8%)	$\chi^2=2.032$ p=0.154
TPO (days)	23.7 (±31.1; 4-178)	20.4 (±19.9; 4-103)	t=0.741 p=0.460
Dysphagia	<i>Yes</i> 13 (14.1%) <i>No</i> 79 (85.9%)	38 (57.6%) 28 (42.4%)	$\chi^2=33.183$ <b>p&lt;0.001</b>
M-FIM	48.1 (±19.4; 15-90)	30.3 (±17.3; 13-85)	t=5.946 <b>p&lt;0.001</b>
T-FIM	70.4 (±24.2; 20-123)	48.0 (±22.7; 18-117)	t=5.895 <b>p&lt;0.001</b>
LOS (days)	53.5 (±14.3; 11-86)	62.9 (±22.3; 12-195)	t=-3.236 <b>p&lt;0.001</b>
PhT (sessions)	90.3 (±26.5; 19-148)	107.5 (±38.2; 22-334)	t=-3.358 <b>p&lt;0.001</b>
SpT (sessions)	32.8 (±18.3; 0-82)	42.8 (±20.1; 0-120)	t=-3.262 <b>p&lt;0.001</b>
OcT (sessions)	17.9 (±14.4; 0-54)	22.2 (±13.5; 0-48)	t=-1.872 p=0.063

6 \*Data available on 143 patients. TPO = time post onset; LOS = length of stay; PhT = physical therapy; SpT  
7 = speech therapy; OcT = occupational therapy.



1 **Table 2.** Cognitive characteristics at baseline by discharge location (home vs. institutional setting, IS).

2 Continuous variables are reported as mean (SD; range min-max); categorical as N (%).

3

	<b>Home</b> N=92 (58.2%)	<b>IS</b> N=66 (41.8%)	Test
H-index	51.3 (±10.8; 28,6-72.5)	45.8 (±12.3; 25.8-75.6)	t=3.002 <b>p=0.003</b>
Token Test	47.6 (±12.6; 25-72)	24.4 (±12.5; 25-70)	t=2.725 <b>p=0.007</b>
Repetition	52.8 (±12.6; 22-80)	46.7 (±15.8; 22-80)	t=2.467 <b>p=0.015</b>
Written Language	51.2 (±12.1; 31-80)	46.5 (±11.5; 31-74)	t=3.002 <b>p=0.003</b>
Naming abilities	52.6 (±13.4; 31-80)	46.2 (±13.0; 31-80)	t=3.014 <b>p=0.003</b>
Comprehension	48.7 (±11.6; 15-81)	41.5 (±13.7; 15-80)	t=3.571 <b>p&lt;0.001</b>
CPM (pure nonverbal reasoning)			
	<i>Impaired</i>	20 (21.7%)	31 (47.0%)
	<i>Normal</i>	72 (78.3%)	35 (53.0%)
			$\chi^2=11.192$ <b>p&lt;0.001</b>
Right-sided USN			
	<i>Yes</i>	5 (5.4%)	4 (6.1%)
	<i>No</i>	87 (94.6%)	62 (93.9%)
			$\chi^2=0.028$ p=0.867

4 CPM = colored progressive matrices; USN = unilateral spatial neglect.

1 **Table 3.** Functional and linguistic characteristics at discharge point, analyzed by discharge location  
 2 (home vs. institutional setting, IS). Continuous variables are reported as mean (SD; range min-  
 3 max), categorical as N (%).

	<b>Home</b> N=92 (58.2%)	<b>IS</b> N=66 (41.8%)	Test
M-FIM	70.5 (±18.4; 15-91)	54.2 (±21.7; 15-91)	t=5.069 <b>p&lt;0.001</b>
T-FIM	97.7 (±22.8; 26-126)	77.4 (±27.0; 24-124)	t=5.060 <b>p&lt;0.001</b>
H-index	55.5 (±11.3; 33.5-75.4)	47.8 (±12.0; 25.8-72.8)	t=3.349 <b>p=0.001</b>
Token Test	52.5 (±11.3; 25-74)	45.6 (±11.5; 25-74)	t=3.097 <b>p=0.003</b>
Repetition	55.2 (±12.5; 22-80)	48.1 (±14.1; 22-76)	t=2.747 <b>p=0.007</b>
Written Language	54.9 (±12.9; 31-80)	47.8 (±12.5; 31-80)	t=2.861 <b>p=0.005</b>
Naming abilities	59.6 (±14.2; 31-80)	49.7 (±13.8; 31-80)	t=3.624 <b>p&lt;0.001</b>
Comprehension	52.7 (±10.9; 30-73)	45.2 (±11.5; 15-73)	t=3.491 <b>p=0.001</b>
Dysphagia	<i>Yes</i> 2 (2.2%) <i>No</i> 90 (97.8%)	23 (34.8%) 43 (65.2%)	$\chi^2=30.805$ <b>p&lt;0.001</b>

4

1 **Table 4.** Logistic Regression Model for home discharge. The model yields a Cox and Snell coefficient that  
 2 explains the 3233% of the variance.

3

	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>OR</b>	<b>95% CI</b>		<b>p</b>
					<b>lower</b>	<b>upper</b>	
Gender ( <i>Male vs Female</i> )	0,400	0,421	0,903	1,492	0,654	3,404	0,342
Age	0,042	0,023	3,286	1,043	0,997	1,091	0,070
M-FIM	0,035	0,014	6,457	<b>1,035</b>	1,008	1,063	<b>0,011</b>
Dysphagia ( <i>No vs Yes</i> )	1,932	0,485	15,896	<b>6,902</b>	2,670	17,842	<b>0,000</b>
CPM ( <i>Normal vs Impaired</i> )	1,092	0,449	5,903	<b>2,979</b>	1,235	7,188	<b>0,015</b>
Token Test	0,005	0,027	0,036	1,005	0,954	1,059	0,850
Repetition	0,033	0,023	2,051	1,033	0,988	1,080	0,152
Written Language	-0,006	0,031	0,034	0,994	0,935	1,057	0,855
Naming	-0,020	0,027	0,580	0,980	0,929	1,033	0,446
Comprehension	0,008	0,027	0,077	1,008	0,955	1,063	0,782

4 CPM = colored progressive matrices (pure nonverbal reasoning).

DRAFT