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Role of Aphasia in Discharge Location After Stroke

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Abstract

Objective—To evaluate language deficits after acute stroke and their association with post-acute care at an institutional setting (IS). We hypothesized that deficits in language comprehension would be associated with discharge to IS after adjustment for physical/occupational therapy (PT/OT) needs.

Design—We abstracted discharge location from the medical record. Demographic characteristics (age, gender, race) and the presence of PT/OT recommendations were abstracted to determine if these variables confounded the association between specific language deficits and IS discharge.

Setting—Acute stroke unit at tertiary medical center.

Participants—Hemispheric stroke patients within 24-hours of event.

Interventions—The following tasks were administered: (a–b) oral and written naming of pictured objects, (c) oral naming with tactile input (tactile naming), (d–f) oral reading, oral spelling, and repetition of words and pseudowords, (g) written spelling to dictation, (h) spoken word-picture verification (ie, auditory comprehension), and (i) written word-picture verification (ie, written word comprehension).

Main outcome measure—Discharge to IS.

Results—Of 152 cases, 88 were discharged home and 64 to an IS. Among stroke subjects discharged to an IS, 63.6% had auditory comprehension deficits compared to 42.9% of those discharged home ($p=0.03$). Deficits in auditory and reading comprehension and oral spelling to dictation were significantly associated with increased odds of discharge to an IS after adjustment for PT/OT recommendations.

Conclusions—Cases with deficits in auditory comprehension, reading comprehension, and oral spelling to dictation had increased odds of being discharged to IS. Early evaluation of these language deficits and prompt treatment may allow patients that would otherwise be discharged to an institution to go home. Further research is needed to design and evaluate individualized treatment protocols and their effect on discharge recommendations.

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Keywords

stroke; aphasia; rehabilitation; language; discharge

Fundamental to the rehabilitation process, is the ability to learn, carry over and communicate new information. Therefore any disturbances of memory, comprehension and language will predictably affect outcomes in the rehabilitation setting. Aphasia presents a challenge to the stroke rehabilitation process and often results in reduced participation in society since major forms of communication occur through spoken and written language (1, 2). Aphasia occurs in more than 33% of stroke survivors (3), has direct consequence on functional recovery (4, 5) and has been shown to impact both the Barthel and Rivermead Mobility Indexes (6). In a recent prospective study, Gialenella et al found that patients with aphasia have lower motor-FIM and cognitive-FIM scores both at admission and at discharge, compared with those without aphasia, and that it plays a role in discharge destination after stroke (7). Presence of aphasia is not only a hindrance to motor recovery and quality of life, but also increases the risk of depression, anxiety, and memory impairments (5, 6).

The ability to predict outcomes of stroke provides the rehabilitation team a platform to tailor treatment for each individual, ensuring that patient selection maximize the rehabilitation success, that realistic goals are set, and that resources are allocated appropriately (8, 9). Many studies looking at patient and stroke factors such as demographics, stroke risk factors, clinical exam findings, clinical scales, laboratory tests, neuroimaging, stroke severity, and motor deficits (10–12) provide important information that can assist the clinician in predicting stroke outcomes, but few studies have investigated functional outcomes and discharge disposition (home vs. other institutional settings) in stroke patient with aphasia (7).

Studies on the role of aphasia in the determination of appropriate post-acute care setting can help clinician, families, and health care systems allocate resource appropriately and provided aggressive therapies in appropriate settings to maximize functional outcome, and successful re-integration in the community(13–16). Deficits in language and processing skills (the ability to plan and perform a task when prompted) have been showed to be better predictors of rehabilitation cost after stroke compared to motor deficits (17). In contrast, Maehlum S et al. found that presence of aphasia did not significantly affect rehabilitation outcomes in a retrospective study of 277 patients admitted to a stroke rehabilitation program (18). Similar findings have been reported by Carod-Artal et al. and Giaquinto et al. (19, 20).

The aims of this study were to evaluate specific language deficits in the acute phase of stroke and their association with a patient's post-acute care in an institutional setting. To our knowledge previous studies have focused in presence or absence of aphasia, but have not focused on the specific language deficits present and how these are associated with discharge location. Identifying specific language functions that, if affected, may result in discharge to an institutional setting is important to tailor early speech therapy. We hypothesized that deficits in specific language domains (primarily affecting comprehension) would be associated with discharge to institutional settings even when taking into account their physical and occupational therapy needs.

Methods

We reviewed the records of 235 subjects enrolled in our laboratory's study on the Neural Basis of Language and Cognitive Deficits in Acute Stroke. This study was approved by the

institutional review board. We abstracted from the subjects discharge paperwork, when available, the location where each case was discharged after the initial stroke admission.

We identified 152 subjects who had a clear discharge location (88 - home, 50 - acute rehabilitation unit, 14 - nursing home or other institutional setting). Subjects with a diagnosis of stroke or TIA were included in the study (TIA used as the comparison or control group).

Demographic characteristics (age, gender, race) and the presence of physical or occupational therapy recommendations for care after discharge were abstracted to determine if these variables may be associated with the primary outcome of interest (discharge location) and confound the association between specific language deficits and discharge location.

To evaluate language function the following experimental tasks were administered within 24 hours of stroke (or admission in the case of TIA subjects): (a) oral naming of pictured objects, (b) written naming of pictured objects, (c) oral naming of objects with tactile input (tactile naming), (d) oral reading of words and pseudowords, (e) oral spelling to dictation of words and pseudowords, (f) written spelling to dictation, (g) spoken word-picture verification (ie, auditory comprehension), (h) written word-picture verification (ie, written word comprehension), and (i) repetition of words and pseudowords. These experimental tasks were used for the original protocol and have been described elsewhere (Archives reference).

Cases were classified as stroke or TIA based on their original MRI (diffusion weighted images) and are described separately in our analysis.

Statistical Analysis

Sample characteristics are described for stroke and TIA cases based on the location they were discharged to (Home versus any institutional setting). T-tests, fisher's exact tests, and 2-sample tests of proportions were used to determine statistical significance as applicable. Performance on language tasks was recorded as the proportion of errors (% error) and was dichotomized for analysis as normal or abnormal. A percent error of more than 10% was considered abnormal based on normative data (reference).

A logistic regression model was used to adjust for the presence of physical or occupational therapy post-discharge recommendations since, based on the results of bivariate analysis, there was a potential association between this 8 variable and discharge location (p-value on bivariate analysis - 0.19). Models were generated for language functions with a clinically significant difference in language deficits by discharge location and with a p-value < 0.20 on bivariate analysis. Data were analyzed using Intercooled Stata 11 (Stata Corp, 4905 Lakeway Dr, College Park, TX 77845).

Results

Of the 152 cases identified for analysis 88 were discharged from their acute stroke hospital stay to home and 64 to an institutional setting. Of the total sample 29 subjects had a TIA. TIA subjects discharged to an institutional setting were on average 10 years older than those discharged home. This age difference was statistically significant (table 1). No differences in age were found between in stroke cases discharged to home versus to an institutionalized setting. No statistically significant differences in gender, race, physical/occupational therapy recommendations, or stroke volume were found between cases discharged home compared to those discharged to an institution (Table 1).

Among stroke subjects discharged to an institutional setting, 63.6% had auditory comprehension deficits compared to 42.9% of those discharged home. This difference was statistically significant ($p=0.03$). Reading comprehension and tactile naming were affected in 70.7% and 62.9% of stroke cases discharged to an institution compared to 54.0% and 43.6% of those discharged home respectively (Reading comprehension: $p=0.09$, tactile naming: $p=0.08$). There were no differences in oral naming, written naming, oral reading, oral spelling to dictation, written spelling to dictation, and repetition by discharge location (Table 2). For TIA cases, there were no statistically significant differences across these variables by discharge location (data not shown).

A logistic regression model was used to adjust for the presence of PT or OT recommendations on discharge location. Therapy recommendations were not significantly associated with discharge location in any of the models (Table 3). Deficits in auditory comprehension, reading comprehension, oral spelling to dictation were significantly associated with increased odds of discharge to an institutional setting.

Discussion

In the current study, deficits of auditory comprehension, reading comprehension, and oral spelling to dictation were associated with increased odds of discharge to an institutional setting. This association was present after taking into consideration the presence of physical and occupational therapy needs post-discharge. Discharge disposition was not associated with deficits in oral naming, written naming, tactile naming, oral reading, written spelling to dictation, and repetition. To our knowledge, the associations described in this study have not been described elsewhere.

For a stroke patient to return home it is crucial that they can understand instructions provided by the acute care team and have the ability to follow through once they are discharged home. Deficits in comprehension can significantly affect the ability to successfully manage the home environment with the help of family since the information provided will not be understood. In this context admission to institutional settings where rehabilitation and structured environments can be provided is likely the best option to appropriately care for patients after stroke. This is consistent with reports by Petrilli et al and Williams et al. in which they reported that the presence of spontaneous speech and comprehension impairments impacted the patient's ability to return home(21, 22).

If aphasia has a comprehension component that may require patients to receive treatment in institutional settings, early identification of these deficits can hasten treatment efforts, potentially allowing patients to be discharged to the least restrictive environment possible. The findings of this study would support early aphasia evaluation and treatment efforts.

Physical or occupational therapy recommendations did not explain the association between specific language deficits and discharge location. We included this variable in our analysis since it was possible that patients were being discharged to an institutional setting primarily for treatment of physical and self-care deficits with aphasia playing a minor role or no role at all.

Adjusting for this potential confounding variable failed to account for the association found between deficits of auditory comprehension, reading comprehension, and oral spelling to dictation and discharge location.

Age was associated with discharge for TIA patients. TIA cases discharged to an institutional setting were on average 15 years older than TIA cases discharged home or stroke cases (regardless of discharge location). This finding suggests that deficits associated with aging

are an important factor in discharge to an institutional setting even in the absence of lasting neurologic deficits.

Stroke volume (a measure of stroke severity) was not associated with discharge to an institutional setting. Perhaps stroke location and the resulting deficits are a better predictor of post-acute discharge setting.

Most studies looking at the role of aphasia on discharge location have occurred in the rehabilitation setting or post-rehabilitation phase (7, 17, 18, 23). Determination of discharge location (home vs. institution) often occurred after rehabilitation (7). Although these studies have provided insights into outcomes after the rehabilitation process, they do not provide information about the role of aphasia on discharge to settings other than home after acute admission. Comprehensive evaluation of aphasia in the acute stage and prior to discharge can add to the information used to determine if a patient can successfully and safely return home. Perhaps focusing on comprehension rather than speech generation (a more obvious deficit) will be more useful in this context.

Evaluation of aphasia in the hyper-acute stage of stroke can be done (24–28) effectively and given the findings of the current study, it may provide critical information to consider when decisions about the rehabilitation of a stroke case are being made.

The ability to predict early disposition stemming from specific language deficits has realistic and therapy implications. Significant evidence exists for intense impact of aphasia on the individual, their environment (care-giver, community), and healthcare systems (29–32). It is fair to say that aphasia is an important cause of morbidity, and a major factor in decreased health-related quality of life after stroke (33, 34). In a recent population study of patients in long term care facilities, aphasia had the largest negative relationship to preference-based health related quality of life followed by cancer and Alzheimer's disease (35). Knowledge of specific language deficits likely to be seen in the rehabilitation setting, will help the rehabilitation team counsel patients and families about prognosis, length of stay, and community integration. Customized speech therapies can be implemented early in the rehabilitation process to maximize functional recovery. By improving comprehension, other therapeutic interventions can be learned more efficiently hastening rehabilitation of motor, sensory, and neuro-cognitive impairments associated with stroke.

Limitations

This study is a secondary analysis of cases recruited to study the neural basis of language disorders after stroke. As such, data on discharge location was not abstracted upon enrollment. This significantly reduced our sample size and limited the number of comparisons that could be made. We have no concrete evidence to suggest that a missing discharge location was associated with aphasia status; thus the likelihood of bias is small.

Other factors including education, socioeconomic status, location of brain lesions and reperfusion mechanisms have documented roles in aphasia severity after stroke (25, 36–39) these variables should be the focus of future studies focusing on post-acute stroke discharge.

Conclusion

This study identified an association between specific language comprehension deficits and discharge to institutional settings; cases with deficits in auditory comprehension, reading comprehension, and oral spelling to dictation had increased odds of being discharged to institutional settings after stroke. Early evaluation of these language deficits and prompt treatment may allow patients that would otherwise be discharged to an institution to go

home. Further research is needed to design and evaluate individualized treatment protocols and their effect on discharge location.

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Table 1

Subject characteristics by discharge location, N=152 (stroke n=123, TIA n=29)

Variable	D/C home N=88	D/C institution N=64	p-value
Age, years, mean(sd)			
Stroke	60.5(15.9)	60.9(15.9)	0.71
TIA	60.5(13.0)	75.1(11.2)	0.005
Gender, Male, n(%)			
Stroke	38(52.1)	25(50.0)	0.82
TIA	5(41.7)	7(58.3)	0.46
Race, n(%)			
Stroke			0.37
Caucasian	34(46.6)	21(42.0)	
African-American	34(46.6)	28(56.0)	
Other	5(6.8)	1(2.0)	
TIA			0.58
Caucasian	5(33.3)	7(50.0)	
African-American	9(60.0)	7(50.0)	
Other	1(6.7)	0	
PT/OT recs, n(%)			
Stroke	50(80.7)	37(90.2)	0.19
TIA	11(84.6)	10(83.3)	0.93
Stroke Volume(mm³), median (min-max)	3,933(103–408,150)	5,955(88–128,812)	0.79

Table 2

Proportion of Stroke Patients with each language deficits by discharge location

Variable	N	D/C home n(%) N=73	D/C institution n(%) N=50	p-value
Auditory comprehension	114	30(42.9)	28(63.6)	0.03
Written word comprehension	104	34(54.0)	29(70.7)	0.09
Oral naming	94	38(64.4)	26(74.3)	0.32
Written naming	47	23(67.6)	10(76.9)	0.53
Tactile naming	90	24(43.6)	22(62.9)	0.08
Oral reading	77	26(55.3)	20(66.7)	0.32
Oral spelling to dictation	57	23(69.7)	21(87.5)	0.20
Written spelling to dictation	38	19(73.1)	11(91.7)	0.19
Repetition	56	14(45.2)	14(56.0)	0.42

Table 3

Logistic regression Models adjusted for Therapy (PT/OT) recommendations*

Models	N	Odds Ratio	95% Confidence Interval	p-value
Auditory comprehension	96	2.90	1.20 6.97	0.02
Written word comprehension	90	2.48	0.99 6.17	0.05
Tactile naming	77	2.44	0.94 6.36	0.07
Oral spelling to dictation	46	10.46	1.18 92.04	0.03
Written spelling to dictation	31	4.29	0.44 41.73	0.21

* Each variable is addressed independently in a model adjusting for PT/OT recommendations.