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Impaired Cognition and Stroke Rehabilitation Outcomes: Are They Related?

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Abstract

Background: Stroke survivors who exhibit impaired cognition at admission to inpatient rehabilitation may experience participation challenges and poorer functional outcomes than those without impaired cognition. Differences in functional outcomes between stroke survivors with and without impaired cognition may be attributed to age, level of cognitive impairment, and severity of stroke. **Materials and Methods:** A retrospective secondary data analysis was conducted using health-related administrative data acquired from a Southwestern Ontario hospital's stroke rehabilitation database. The aim was to explore potential linkages between post-stroke impaired cognition and functional gains, rehabilitation stays, and living settings after discharge from rehabilitation. **Results:** An aggregate sample of 393 males and 314 females subclassified as experiencing mild, moderate, and severe stroke was analyzed. At inpatient rehabilitation admission, 21.5% (n = 152) of these patients had no impaired cognition, 33.7% (n = 238) had mild impaired cognition, 22.2% (n = 157) had moderate impaired cognition, and 22.6% (n = 160) had severe impaired cognition. Cognitively impaired stroke patients were significantly ($p < 0.001$) older, had (mostly) moderate to severe stroke with significantly ($p = 0.012$) more moderate cognitive impairment, had significantly ($p < 0.001$) longer rehabilitation stays, and a high propensity for being discharged to longer-term care facilities compared to non-cognitively impaired patients. **Conclusion:** Presence of significant dissimilarity in rehabilitation stays and post-discharge destinations among stroke survivors with and without cognitive impairment is attributed to the age of the patient, level of cognitive impairment, and rigorous rehabilitation interventions.

Keywords

Stroke, Impaired Cognition, Inpatient Rehabilitation, Functional Outcomes

1. Introduction

Impaired cognition may increase the length of time it takes for stroke survivors to be referred or admitted to stroke rehabilitation units and hinder their ability to participate in rehabilitation programs for stroke [1] [2]. Factors like severity and type of stroke may worsen the stroke patient's cognitive function, leading to delays in rehabilitation/recovery and poorer functional outcomes [1] [3] [4]. Decreased memory and attention deficits have been identified as independent predictors of lack of participation and consistency in stroke rehabilitation, consequently leading to worse rehabilitation outcomes [5]. Stroke patients with these cognitive deficits may be restricted from participating in the same rehabilitative activities as their non-cognitively impaired counterparts [6]. The patients with cognitive limitations often require case-specific therapy to optimize their cognitive and physical recovery [7]. Minimal research has focused on the specific effects of post-stroke cognitive status on functional outcomes (such as functional gains, rehabilitation stays, and discharge living settings) following inpatient rehabilitation. A few previous studies have suggested that impaired cognition correlates with older age [8], longer rehabilitation stays [2] [6], and discharge to extended care facilities [2] [9] [10] [11] [12]. A single study reported a decrease in functional gains among cognitively impaired patients [13], but other studies demonstrated improvements in motor function among stroke patients with impaired cognition [6] [14]. These studies were Chinese Japanese, Korean, Irish, British, and American studies, with none identified as Canadian studies.

In this study, the associations of cognitive status at admission to inpatient rehabilitation and functional outcomes were examined. The study was chosen because previous research indicates that the majority of patients who survive stroke events experience an ischemic stroke, have a 25% - 30% occurrence of Vascular Cognitive Impairment (VCI), and a 4-fold increase in the rate of experiencing cognitive decline compared to hemorrhagic stroke patients [15]. The fact that stroke is the third leading cause of death and the leading cause of disability in Canada; that stroke causes substantial economic burden on the Canadian health care system [16], and the significant lack of current Canadian research on this topic prompted us to undertake the study with a focus on Southwestern Ontario. Potential associations between cognitive status and stroke severity were examined as severe stroke patients may experience memory decline, confusion and communication difficulties, and may require a rehabilitation program that is tailored to their needs [7].

Further, the associations between cognitive status and time from ready for admission to actual rehabilitation admission date were examined, as patients with cognitive deficits tend to experience participation delays and often need to be encouraged to participate in rehabilitation programs [2]. In addition, the associations between cognitive status and living settings post-discharge were examined, as patients with cognitive decline may require extended care services upon discharge from rehabilitation. We hypothesized that impaired cognition will be associated with 1) longer time to rehabilitation admission, 2) increased

severity of stroke at inpatient rehabilitation admission, and 3) longer lengths of stay (LOS), lower functional (FIM) improvements, and higher rates of discharge to longer-term care facilities.

2. Materials and Methods

2.1. Research Design

A retrospective secondary data analysis was conducted using health-related administrative data acquired from a Southwestern Ontario hospital's stroke rehabilitation database. These data were patient-level information comprised of sociodemographic, clinical, and outcome features. The data were mined from the National Rehabilitation Reporting System (NRS). Subjects were patients diagnosed with stroke (Rehabilitation Client Group (RCG: 1150 - 1160 (mild), 1120 - 1140 (moderate), and 1100 - 1110 (severe), admitted to and discharged from a rehabilitation unit between April 2014 and March 2018 [17]. Impaired cognition was defined as having an admission cognitive FIM score < 30 (24 - 29 mild impaired cognition, 18 - 23 moderate impaired cognition, and <18 severe impaired cognition) and no impaired cognition was defined as having admission cognitive FIM score of 30+ points [2]. Clearance for ethical acceptability of this research was obtained from the University of Windsor Research Ethics Board (REB# 23-108).

2.2. Study Sample and Setting

Stroke cases were adults clinically diagnosed with either ischemic or hemorrhagic stroke and had a clear documentation of LOS in rehabilitation. The required sample size with adequate statistical power to identify notable disparities in means was estimated using the G*Power software [18]. According to the power analysis (effect size = 0.5, power = 0.80, and alpha = 0.05), a sample of 144 cases would be sufficient to detect mean differences between distinct groups, but a larger sample was obtained from the institution. Fifty-eight cases (707 left) were excluded because of unspecified living settings (n = 16); the living setting being a boarding house (n = 1), and missing data (n = 41). We excluded the boarding house living setting because it was a temporary post-discharge location, and individuals in this location could move to other locations, thus hindering the health professionals' ability to do post-discharge follow-up.

2.3. Data Collection and Instruments

The Functional Independence Measure (FIM) instrument was used to assess both cognitive and motor functions of stroke patients during inpatient rehabilitation admission and at discharge from the rehabilitation unit. The tool assesses an individual's level of disability and assistance needed to complete certain daily activities. Cognitive functions assessed with this tool were comprehension, expression, social interaction, problem-solving, and memory. Scores ranging from 1 to 7 were assigned to each function, with 1 indicating total dependence, and 7 indicating complete independence. The assessments were completed by trained physiotherapists within 72 hours following inpatient rehabilitation admission.

Levels of stroke severity were determined by individual functional scores. Patients categorized as experiencing mild stroke had an early FIM score that exceeded 80 points, (40 - 80 points for moderate stroke, and less than 40 points for severe stroke) [19] [20]. Impaired cognition was defined as having admission cognitive FIM score < 30 (24 - 29 mild impaired cognition, 18 - 23 moderate impaired cognition, and <18 severe impaired cognition), and no impaired cognition was defined as having admission cognitive FIM score of 30+ points [2]. The FIM tool has been tested among trained healthcare professionals and deemed to be feasible to use, clinically relevant, reliable, and valid [21]. To calculate functional change, the individual's admission total FIM score was subtracted from the overall functional score at discharge. To calculate FIM efficiency, we divided the average functional change by the average LOS during rehabilitation [22] [17]. Additional data captured by the FIM instrument include marital status, age, sex, pre-admission living setting, LOS in rehabilitation unit, pre-existing comorbidities, and post-discharge living setting [17] [22].

2.4. Data Analysis

Using SPSS software version 29.0 descriptive summaries of data were generated. Frequencies and percentages of categorical variables were computed, and the measures of central tendency such as the medians (IQR) and means (standard deviation) for continuous variables were computed. Potential Variations in LOS and FIM change among stroke survivors with impaired and unimpaired cognition were determined with the use of independent samples t-test. The association between impaired or unimpaired cognition and stroke severity, and the association between cognitive status and living settings after discharge from rehabilitation were explored with the help of Chi-square tests. Potential correlations between continuous and discrete variables were analyzed using Spearman's rho. With the use of a 2-way ANOVA, we determined the interaction and main effects of predictor variables on the outcome variable. The Kruskal-Walli's test was performed to identify the variations in functional gains among distinct categories of cognitive functional scores upon rehabilitation admission.

3. Results

The study included 707 patients (393 males and 314 females) admitted to and discharged from a Southwestern Ontario hospital's stroke rehabilitation unit within a period between April 2014 and March 2018. Subjects were adults clinically diagnosed with either ischemic or hemorrhagic stroke. They were subclassified as experiencing mild, moderate, or severe stroke according to their initial admission functional score. Additionally, they were further subcategorized into mild, moderate, severe, or no cognitive impairment according to their initial admission cognitive FIM score (see **Table 1**). Rehabilitation LOS for all stroke survivors showed a mean of 34.96 ± 28.68 days, and FIM change for all strokes revealed a mean of 24.24 ± 14.15 points [17]. We investigated the relationship between the presence or absence of cognitive dysfunction and the patient's age at

admission to inpatient rehabilitation (refer to Figure 1). Of those included in the study, 21.5% (n = 152) had no impaired cognition, 33.7% (n = 238) had mild impaired cognition, 22.2% (n = 157) had moderate impaired cognition, and 22.6% (n = 160) had severe impaired cognition. Stroke patients exhibiting mild cognitive impairment had a mean age of 70.67 ± 13.1 years (70.96 ± 14.57 years no mild cognitive impairment), 73.36 ± 14.21 years for stroke patients exhibiting moderate cognitive impairment (70.15 ± 13.97 years no moderate cognitive impairment), and 71.25 ± 14.17 years for stroke patients exhibiting severe cognitive

Table 1. Demographic features of subjects.

Features	Overall	No Cognitive Impairment	Mild Cognitive Impairment	Moderate Cognitive Impairment	Severe Cognitive Impairment
Age at inpatient rehabilitation (years)					
Mean ± SD	70.86 ± 14.08	68.16 ± 14.95	70.67 ± 13.1	73.36 ± 14.21	71.25 ± 14.17
Median (IQR)	73 (62 - 82)	71(61 - 80)	72 (62 - 80)	77 (67 - 84)	73 (61 - 83)
Sex, %					
Male	55.6	61.8	55.9	49.0	55.6
Female	44.4	38.2	44.1	51.0	44.4
Stroke Etiology, %					
Ischemic stroke	81.3	82.9	82.4	79.0	80.6
Hemorrhagic stroke	18.7	17.1	17.6	21.0	19.4
Severity of stroke, %					
Mild Stroke	27.3	51.3	35.3	12.7	6.9
Moderate Stroke	64.2	48.7	64.3	82.2	61.3
Severe Stroke	8.5	0.0	0.4	5.1	31.9

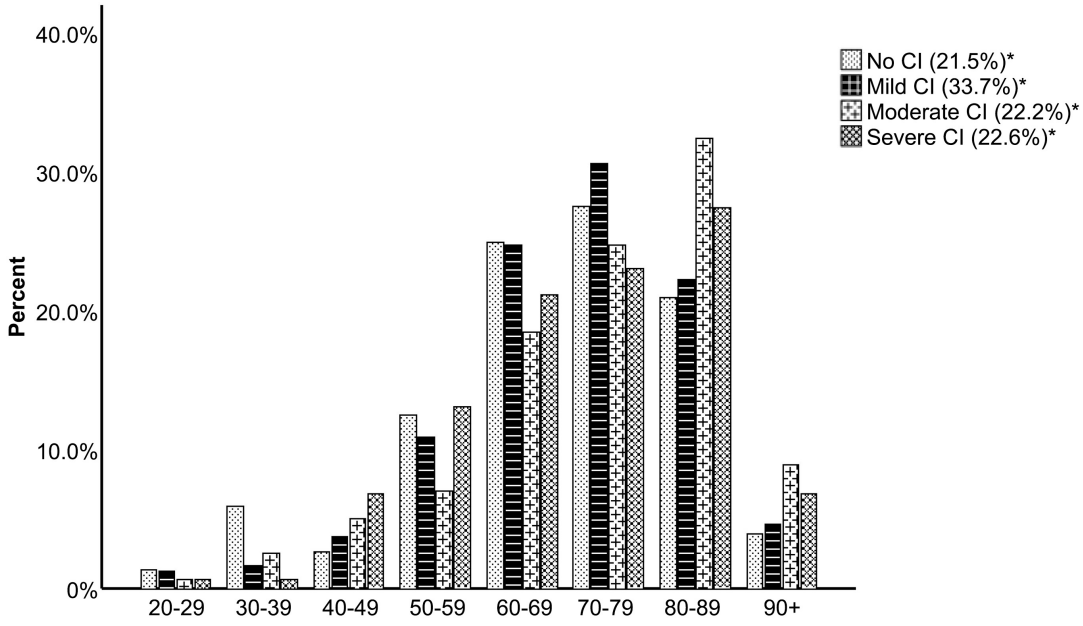

Figure 1. Age category at inpatient rehabilitation admission. *Levels of Cognitive Impairment (CI).

impairment (70.74 ± 14.06 years no severe cognitive impairment). The overall mean age for stroke patients with/without impaired cognition was 70.86 ± 14.08 years (see Table 2).

Table 2. Demographic and clinical features of subjects by dichotomized cognitive impairment.

Features	Overall	Cognitive Impairment	No Cognitive Impairment
Age at Inpatient Rehabilitation (years)			
Mean ± SD	70.86 ± 14.08	71.6 ± 13.76	68.16 ± 14.95
Median (IQR)	73 (62 - 82)	73 (63 - 82)	71 (61 - 80)
Patient's Sex, %			
Male	55.6	53.9	61.8
Female	44.4	46.1	38.2
Stroke Etiology, %			
Ischemic stroke	81.3	80.9	82.9
Hemorrhagic stroke	18.7	19.1	17.1
Severity of Stroke, %			
Mild Stroke	27.3	20.7	51.3
Moderate Stroke	64.2	68.5	48.7
Severe Stroke	8.5	10.8	0.0
Days between ready for admission and admission date			
Mean ± SD	2.28 ± 4.24	2.25 ± 4.25	2.42 ± 4.20
Median (IQR)	0.00 (0.00 - 3)	0.00 (0.00 - 3)	0.00 (0.00 - 3)
Total FIM at Admission			
Mean ± SD	67.52 ± 19.76	63.99 ± 19.58	80.41 ± 14.34
Median (IQR)	69 (54 - 82)	64 (49 - 78)	81 (70 - 90)
Total FIM at Discharge			
Mean ± SD	91.74 ± 22.64	88.51 ± 22.96	103.52 ± 16.86
Median (IQR)	96 (77 - 110)	93 (74 - 107)	109 (93 - 116)
Length of Stay in rehabilitation (days)			
Mean ± SD	35.0 ± 28.68	36.79 ± 30.03	28.28 ± 21.92
Median (IQR)	27 (17 - 44)	28 (18 - 46)	21 (14 - 35)
Functional (FIM) Change			
Mean ± SD	24.21 ± 14.15	24.52 ± 14.80	23.11 ± 11.44
Median (IQR)	24 (15 - 33)	24 (15 - 33)	25 (16 - 31)
Pre-admission living setting, %			
Home with no Health Services	81.3	79.6	87.5
Home with health services	13.3	13.9	11.2

Continued

Assisted Living	4.8	5.8	1.3
Residential Care	0.6	0.7	0.0
Post-discharge living Setting, %			
Home with no Health Services	7.1	5.6	12.5
Home with health services	66.5	65.2	71.1
Assisted Living	9.2	9.5	7.9
Residential Care	15.3	17.7	6.6
Acute care.	2.0	2.0	2.0

To determine the variations in age among stroke survivors with and without mild, moderate, or severe impaired cognition, an independent-samples t-test was performed which revealed a significant disparity in age between stroke survivors with moderately impaired cognition and survivors with no moderate impaired cognition ($t(705) = -2.53$, $p = 0.012$, two-tailed). This finding demonstrates a minor disparity in the mean age (mean difference = −3.211, 95% CI: −5.703 to −0.719) of stroke survivors with and without moderate cognitive impairment (Cohen's d = −0.229; Cohen, 2013), suggesting that at inpatient rehabilitation admission, stroke patients without moderate cognitive impairment were slightly younger than those with moderate cognitive impairment. Age did not differ significantly among stroke survivors presenting with mild and no mild cognitive impairment ($t(523) = 0.265$, $p = 0.791$, two-tailed) or those presenting with severe and no severe cognitive impairment ($t(705) = -0.400$, $p = 0.690$, two-tailed).

3.1. Does the Patient's Cognitive Status Correlate with Severity of Stroke during Rehabilitation Admission?

The relationships between impaired versus unimpaired cognition and stroke severity were determined by examining individual patients' FIM scores upon admission to rehabilitation (see Figure 2). Cognitively impaired individuals exhibited a mean FIM score of 63.99 ± 19.58 points upon admission to rehabilitation (80.41 ± 14.32 for non-cognitively impaired individuals), with an overall mean FIM score of 67.52 ± 19.76 points. Table 1 presents the percentage distribution of cognitively impaired individuals with stroke severities upon admission to inpatient rehabilitation. In an effort to ascertain whether the levels of cognitive impairment differed significantly between stroke severities, Chi-square test for independence was performed. Levels of impaired cognition demonstrated a notable association with the category of function (severity of stroke) at the onset of rehabilitation. χ^2 (6, n = 707) = 224.54, $p < 0.001$, Cramer's v = 0.398, with a large magnitude of effect.

3.2. Does the Patient's Cognitive Status Correlate with Time to Rehabilitation Admission?

To gain a deeper insight into how a patient's cognitive status influences the length

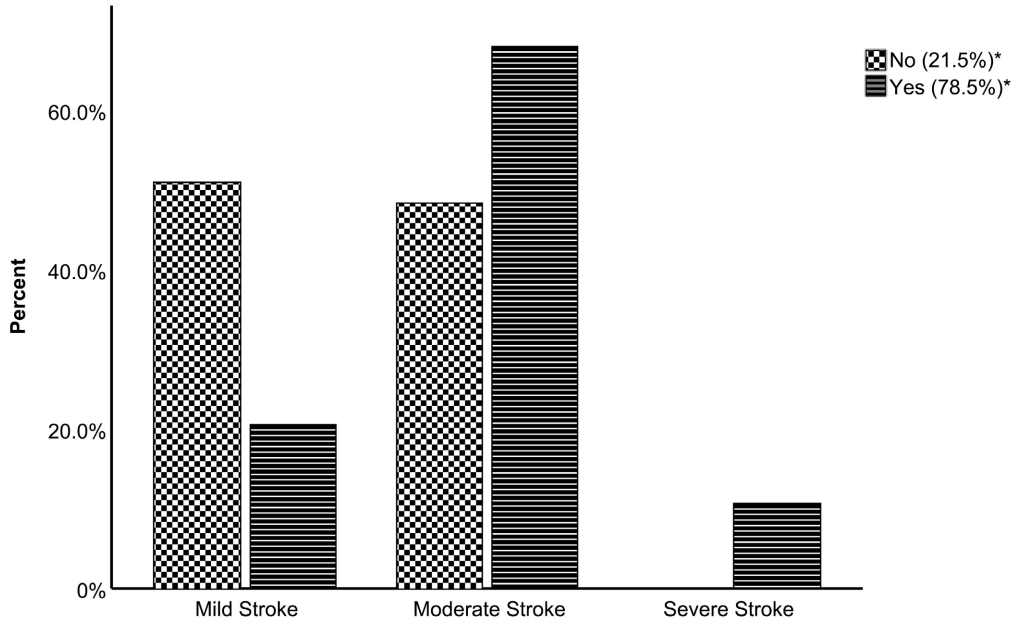

Figure 2. Category of functional impairment based on admission FIM score. *Cognitive Impairment.

of time until inpatient rehabilitation admission, we first explored the connections between the time (measured in days) from readiness for admission to the actual date of rehabilitation admission and the cognitive FIM score upon admission to inpatient rehabilitation. The mean duration between being ready for admission and the actual date of rehabilitation admission was 2.42 ± 4.20 days for non-cognitive impairment, 2.17 ± 3.74 days for mild cognitive impairment, 2.37 ± 5.18 days for moderate cognitive impairment, and 2.24 ± 3.96 days for severe cognitive impairment, with overall mean time from ready for rehabilitation admission of 2.28 ± 4.24 days. Using the independent samples t-test, we analysed and compared the variation in time from a readiness for admission to the actual date of rehabilitation admission among stroke patients with and without cognitive impairment. No statistically significant distinction was found in the duration from readiness for admission to the date of rehabilitation admission between patients with cognitive impairment and those without, $t(705) = 0.449$, $p = 0.653$, two-tailed). Effect size for this mean difference in time to rehabilitation admission (mean difference = 0.174, 95% CI: −0.587 - 0.936) between cognitively impaired stroke patients and non-cognitively impaired patients was minimal (Cohen's $d = 0.041$).

3.3. Does the Patient's Cognitive Status Correlate with Functional Improvements during Rehabilitation?

We investigated the associations between cognitive impairment levels upon admission to stroke rehabilitation units and the changes in function during rehabilitation. Non-cognitively impaired stroke patients exhibited a mean FIM change of 23.11 ± 11.44 points during inpatient rehabilitation, 24.68 ± 13.26 points for mild cognitively impaired stroke patients, 24.22 ± 14.76 points for

moderate cognitively impaired stroke patients, and 24.56 ± 16.95 points for severe cognitively impaired stroke patients, with an overall mean FIM change of 24.21 ± 14.15 points. To determine the variations in FIM changes among the different levels of cognitive impairment, we conducted a Kruskal-Wallis H test. This involved comparing the mean FIM changes across stroke patients with no impaired cognition, mildly impaired cognition, moderately impaired cognition, and severely impaired cognition. The mean FIM changes did not show any statistically significant disparities across the four levels of cognitive impairment (n = 152: no impaired cognition; n = 238: mildly impaired cognition; n = 157: moderately impaired cognition; n = 160: severely impaired cognition), χ^2 (3, n = 707) = 0.576, p = 0.902. To understand the rate of enhancement in functional capabilities with each day of rehabilitation, we analyzed the FIM efficiency of cognitively impaired and non-cognitively impaired stroke patients. The FIM efficiency was 0.67 points for cognitively impaired stroke patients and 0.82 points for non-cognitively impaired stroke patients.

3.4. Does the Patient's Cognitive Status Correlate with Inpatient Rehabilitation Stays?

An investigation of potential correlations between a patient's cognitive status upon admission to rehabilitation unit and the individual's LOS (measured in days) during the rehabilitation period (refer to Figure 3). The mean LOS in rehabilitation was 36.79 ± 30.03 days for cognitively impaired stroke patients and 28.28 ± 21.92 days for non-cognitively impaired patients, with an overall mean LOS of 34.96 ± 28.68 days. A significant disparity was observed in the mean LOS in rehabilitation between stroke survivors with impaired cognition, with a mean

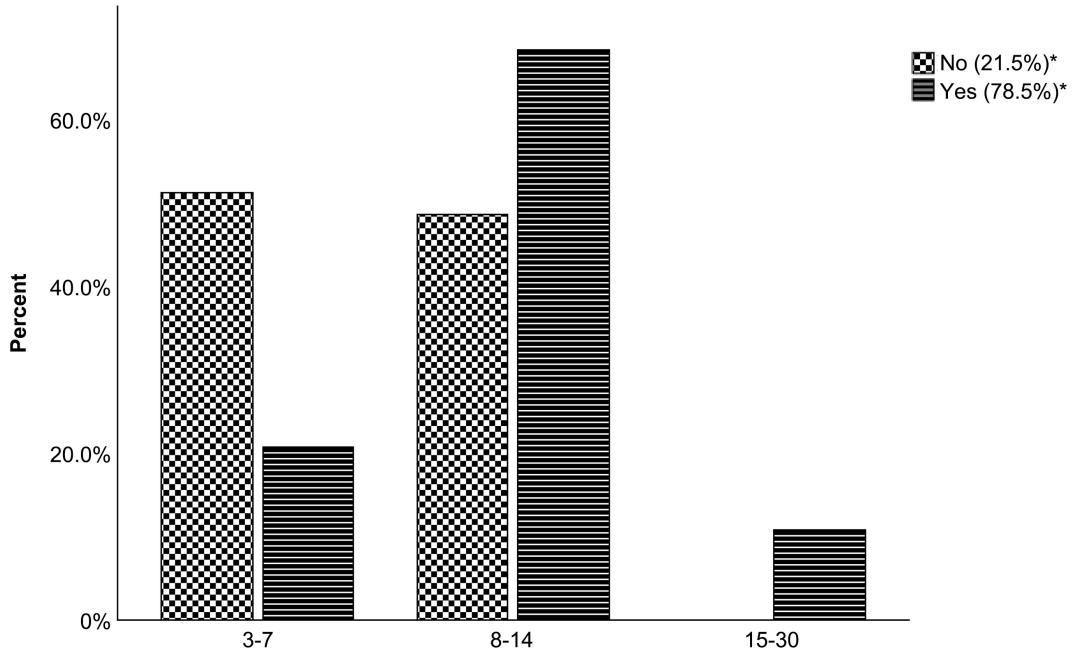

Figure 3. Groups of LOS for inpatient rehabilitation. *Cognitive Impairment.

of 36.79 ± 30.03 days and stroke survivors with no impaired cognition, with a mean of 28.28 ± 21.92 days; $t(705) = -3.892$, $p < 0.001$, two-tailed). A medium effect size of this means difference (mean difference = −8.515, 95% CI: −12.82 to −4.21) was found (Cohen's $d = -0.30$).

3.5. Is Cognitive Status Associated with Patient's Living Setting Post-Discharge?

Additionally, we aimed to investigate whether patients' cognitive status played a role in determining their living arrangements post-discharge. Thus, we analyzed the association between cognitive status and their living settings after discharge from rehabilitation as depicted in Figure 4. Upon completion of inpatient rehabilitation, 71.1% of non-cognitively impaired stroke patients (65% cognitively impaired) were discharged to home with paid professional healthcare services while 12.5% of non-cognitively impaired stroke patients (5.6% cognitively impaired) were discharged to home with no healthcare services. Concerning alternative post-discharge arrangements, 17.7% of cognitively impaired stroke patients (6.6% non-cognitively impaired) were discharged to residential care, 9.5% (7.9% non-cognitively impaired) were released to assisted living facilities, and 2% (2% non-cognitively impaired) were discharged to acute care (refer to Table 2). Using Chi-square test for independence, we established that cognitive impairment levels correlate significantly with the living settings of stroke patients after discharge from rehabilitation, $\chi^2(4) = 18.62$, $p < 0.001$, and the magnitude of the effect was medium, Cramer's $V = 0.162$. Our findings seem to suggest that cognitive impairment is an important element in determining the discharge destination of stroke patients.

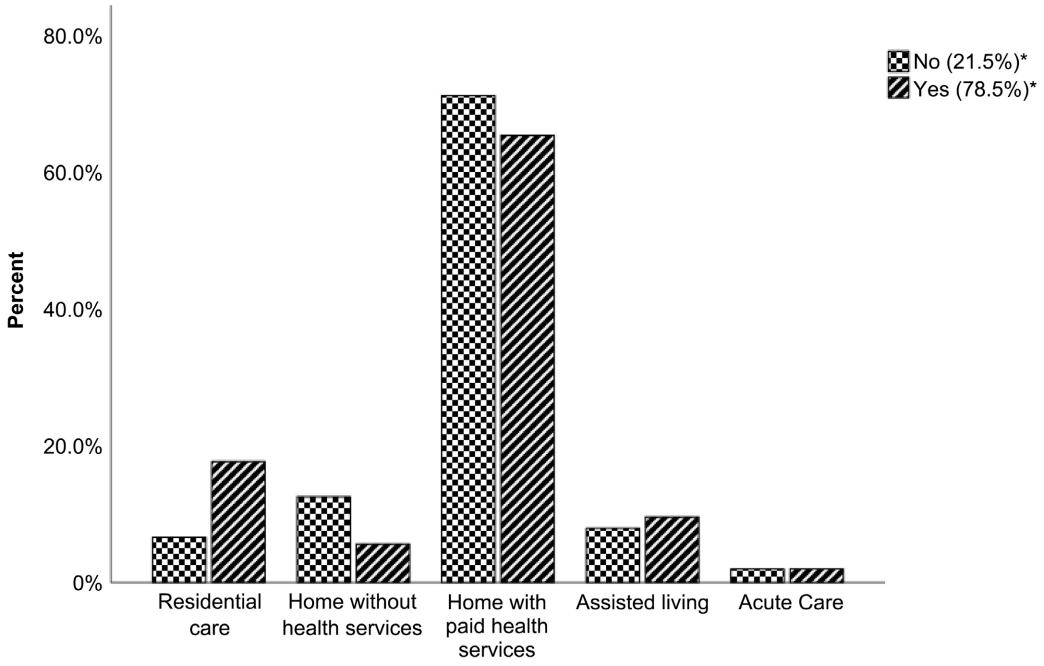

Figure 4. Post hospital living setting. *Cognitive Impairment.

We also chose to investigate whether the pre-admission living setting of stroke survivors with impaired and unimpaired cognition had an impact on their post-discharge living settings. Upon admission to inpatient rehabilitation, 87.5% of non-cognitively impaired stroke patients (79.6% cognitively impaired) reportedly lived at home with no professional healthcare services. Other pre-admission living arrangements with percentage of cases for each living setting are depicted in Table 2. Findings from a Chi-square test showed a small non-substantial correlation linking cognitive impairment levels and pre-admission living settings of stroke patients, χ^2 (3, n = 707) = 7.57, p = 0.056, Cramer's v = 0.103.

3.6. Do the Patients' Age and Cognitive Status Correlate with Functional Rehabilitation Gains?

Lastly, the combined influence of age and cognitive status on functional changes during inpatient rehabilitation was investigated (refer to Figure 5). The mean FIM change during rehabilitation was notably greater for patients under 65 years (Mean = 26.35 ± 16.12) than for patients over 65 years (Mean = 23.34 ± 13.23); t(326) = 2.387, p = 0.018, two-tailed). A small effect magnitude for the means differences (mean difference) = 3.014, 95% CI: 0.53 to 5.50 was noted (Cohen's d = 0.21). Additionally, an investigation of the potential effects of cognitive status and age on functional changes during rehabilitation was carried out to ascertain whether these effects on FIM gain differ significantly across various age categories. To accomplish this, a two-way ANOVA was performed. Results showed no significant interaction effect of age and cognitive status on FIM gain. (F(7, 691) = 1.504, p = 0.163). Also, there was no main effect for severity of cognitive impairment (F(1, 691) = 4.02, p = 0.162). However, a statistically significant main

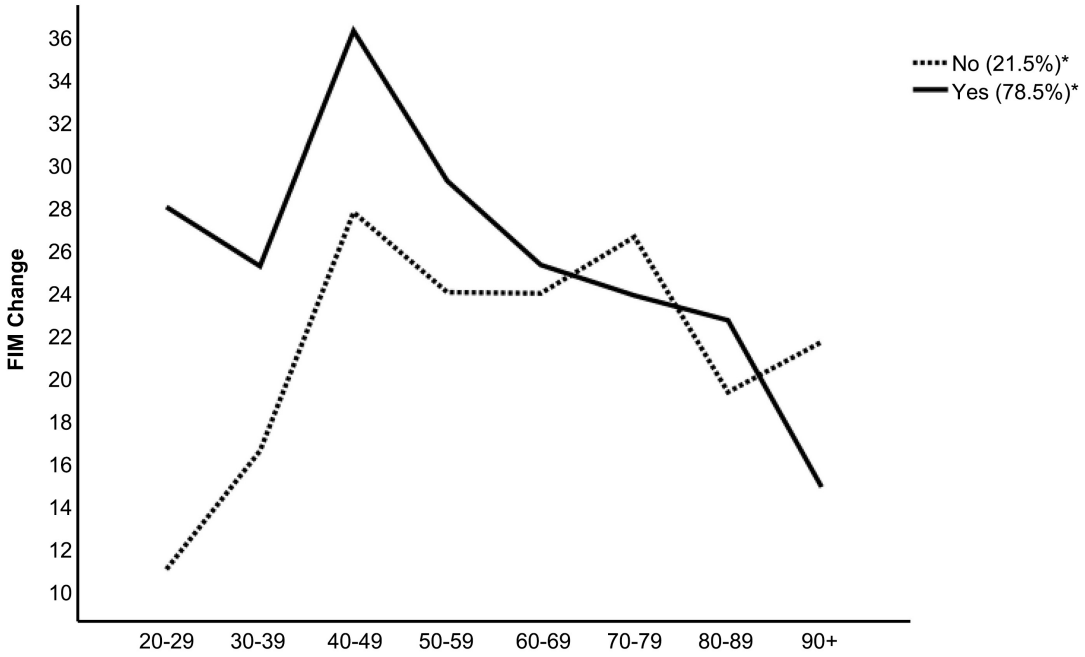

Figure 5. Age category at inpatient rehabilitation admission. *Cognitive Impairment.

effect of age was found ($F(7, 691) = 2.609$, $p = 0.012$), but the effect magnitude was very small (partial eta squared = 0.026).

4. Discussion

4.1. Critical Points

This research was a secondary data analysis completed using health-related administrative data, acquired from a Southwestern Ontario hospital's stroke rehabilitation database. In this hospital, cognitive impairment in stroke was assessed at admission and discharge from inpatient rehabilitation, using the FIM instrument and the Montreal Cognitive Assessment (MoCA) scale. However, the MOCA data were not directly reported to the National Rehabilitation Reporting System (NRS) and were not utilized in this study. Older individuals (aged 65 and above) with cognitive impairment following a stroke tended to exhibit more moderate cognitive impairment and were prone to experiencing moderate to severe stroke. Patients with cognitive impairment generally experienced extended rehabilitation stays and were prone to be released to residential care and assisted living facilities or referred to acute care settings for readmission. Conversely, the non-cognitively impaired stroke patients showed an increased tendency to be released to home without professional homecare or to home with paid professional homecare. The functional changes between stroke patients with impaired cognition and those without impaired cognition were not substantially different.

4.2. Influence of the Patient's Cognitive Status on Functional Outcomes

Cognitively impaired stroke patients in this study were older, had moderate to severe stroke with a higher frequency of moderate cognitive impairment, experienced an extended LOS in inpatient rehabilitation, and showed a propensity for being discharged to longer term care facilities. Similar findings have been reported in previous stroke studies that examined the relationships between cognitive impairment and patient's age [8], cognitive impairment and functional changes [23], cognitive impairment and LOS in rehabilitation [2] [6], and cognitive impairment and discharge destination [2] [9] [10] [11] [12]. The prolonged LOS of cognitively impaired stroke patients may be attributed to rigorous rehabilitation interventions that are usually tailored to their specific needs. The lack of a difference in FIM gains between stroke patients with and without impaired cognition suggests that improvement in rehabilitation is not entirely dependent on the presence or absence of impaired cognition. The differences in post-discharge living settings of patients with and without impaired cognition indicate that cognitive deficit is an independent predictor of a patient's discharge disposition after inpatient stroke rehabilitation.

4.3. Potentials for Change

This research has shown that cognitively impaired stroke patients stay longer in

inpatient rehabilitation units, experience similar gains in function as their non-cognitively impaired counterparts and are released to extended care facilities. It is hoped that this study will shed light on whether stroke patients who have impaired cognition have an increased likelihood of experiencing poorer functional outcomes, with a lesser likelihood of benefiting from early rehabilitation interventions than patients with no impaired cognition. This study will enable clinicians to predict cognitive dysfunction at rehabilitation admission, identify stroke patients with a higher risk of experiencing cognitive decline, and tailor care decisions to the needs of individual clients.

4.4. Study Limitations

Some limitations were noted in this research. Study data were obtained from a single hospital in Southwestern Ontario, thus generalizability of findings to other settings or situations may be limited. This limitation may be addressed in future studies using a more diverse sample from multiple hospitals. Since secondary data were utilized in this research, we could not ascertain the accuracy of the data at the time of collection/documentation. This research is the only research that clearly demonstrates the relationships between impaired cognition and functional outcomes of patients undergoing inpatient stroke rehabilitation.

4.5. Conclusion

This research illustrates the linkage between cognitive impairment and the rehabilitation results of stroke survivors within a stroke rehabilitation unit in Southwestern Ontario. In contrast to prior inconsistent findings regarding impaired cognition and its impact on functional changes, this study did not identify any distinctions in the functional improvements of stroke patients with and without impaired cognition. Impaired cognition was associated with older age, moderate to severe stroke, longer LOS in rehabilitation, and discharge to longer-term settings. We observed medium effects of cognitive impairment on stroke severity, rehabilitation LOS, and living setting after discharge, and small effects of cognitive impairment on age and functional changes.

Disclosures

ET and TT have no conflicts to disclose.

Statement of Authorship

ET conceived and designed the study, acquired the data, analyzed the data, interpreted the results, drafted the manuscript, and approved it for publication.

TT interpreted the results, drafted the manuscript, and approved it for publication.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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