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Research Article

Gender Differences in Post-Acute Stroke Rehabilitation Outcomes

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Abstract

Cerebrovascular disease is the 4th leading cause of death and the most prominent cause of disability in the United States. While plethora of studies have examined gender differences in terms of stroke risk factors, stroke presentation, acute treatment, and mortality, little research has focused on differential response to post-acute rehabilitation interventions. This study investigated the improvements in adaptive functioning of 358 participants with a recently diagnosed cerebrovascular accident. The Mayo-Portland Adaptive Inventory – 4 and the Community Integration Questionnaire were used to assess the participants at the time of admission and discharge. The differences in pre- and post-treatment scores revealed that female participants were as likely to benefit from rehabilitative services as their male counterparts. Women exhibited statistically significantly greater change (treatment effect) scores than men, but the absolute gender difference was small and may not be clinically meaningful. While current literature indicates that female stroke patients tend to achieve less complete recovery than men, our findings show that they derive equal benefits from post-acute multidisciplinary rehabilitation treatments. In this sample, women participants exhibited more difficulty with psychosocial adjustment (as measured by the MPAI-4), at admission and at discharge from rehabilitation, but did show more treatment gains than men. Though the main research hypothesis was that there would be significant gender based differences in adaptive functioning (MPAI-4) during stroke rehabilitation, the only significant gender based differences were in psychosocial adjustment.

Keywords: Rehabilitation; Cerebrovascular disease; Post-acute Stroke
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Introduction

Stroke is the fourth leading cause of death after heart disease, cancer, and chronic lower respiratory diseases [1]. Moreover, cerebrovascular disease is the leading cause of long-term disability in the United States [2,3]. Approximately 795,000 new and recurrent strokes occur in the US each year [3]. Cerebrovascular disease can and often does have a devastating impact on the daily functioning of those affected. According to the American Heart Association Statistics Committee and Stroke Statistics subcommittee, significant proportions of stroke victims experience variety of disabilities and deficits (e.g. hemiparesis, cognitive deficits, mood disturbances, aphasia, and motor impairments; [3]). Full 26% of stroke patients become dependent on other caretakers for activities of daily living (ADLs), and the same percentage is placed in inpatient and residential facilities [3].

Recent data have shown that disability outcomes are not shared equitably among men and women. Specifically, women tend to experience greater disability and achieve less full recovery than men [3]. Significant gender differences are also present in the incidence and mortality statistics of cerebrovascular disease [3]. For example, while the prevalence rates of stroke rise from 11% between the ages of 55 and 64 all the way to 43% for those older than 85 [4] for both men and women, differences in incidence exist at all ages [4]. Specifically, the incidence rates are higher in men for all age groups with the biggest discrepancy evident for 55 – 74 year-olds [5]. However, in spite of these findings, approximately 55,000 more women than men suffer a stroke in the US each year [3] consequent to the existing gender discrepancies in life expectancy and over-representation of women in older age groups [6]. Thus, female stroke patients are likely to constitute a greater economic burden on our society than male stroke patients [7]. Considering the staggering medical and rehabilitation costs associated with cerebrovascular disease, which in 2009 reached $38.6 billion [3], these findings underscore the importance of investigating gender differences in functional recovery.

Thus far, the existing research has painted an exceedingly complex and variable picture of gender disparities in stroke occurrence, treatment, and outcomes. A few findings and observations can be seen consistently in the literature. For example, overwhelmingly, studies have found that female stroke patients are significantly older than their male counterparts [5,6,8-11], which may have implications for functional recovery. A number of researchers have also observed that women are more likely to become disabled, transition to an institution or assisted living facility and generally require more support with ADLs post-discharge [6,8,9,12,13]. Still, some investigators suggest that age not sex is a predictor of placement in residential facilities [14].

The divergent findings in the existing literature on sex-based differences in many other aspects of stroke presentation, treatment,

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and outcome clearly illustrate the multifactorial nature of these high-stake elements. For example, while some studies have found gender disparities in the severity of stroke and/or the type of presentation [8,15,16], others reported no difference between female and male participants in these variables [6]. In addition, the research has shown variable results when comparing stroke outcomes for men and women. For instance, in the United Kingdom, Lewsey and colleagues [5] found lower mortality rates for women of all age groups; however they also discovered that 30-day case-fatality rates were higher for women than men independent of age—a gender gap that has widened over the past two decades [17]. Conversely, Watila et al. [16], studying a sample of patients in Northeastern Nigeria, found no differences between the two sexes in 30-day fatality. This finding has also been confirmed by a number of other studies [3,6,15]. Furthermore, Holroyd-Leduc and colleagues [12] reported that women in their study evidenced lower risk of death one year after their stroke occurred.

Much of the existing literature (American Heart Association [18]) on gender differences in stroke research focuses on risk factors, acute treatment, and outcomes resulting from the acute medical management of cerebrovascular disease. The literature about sex-based differences in stroke rehabilitation outcomes for post-acute patients is much sparser. In terms of physical, occupational, and speech therapy, the current literature suggests that there are no differences in access to these services for men and women [6,12,19]. In spite of the availability of services, some studies have revealed that women are likely to recover less fully and experience less favorable outcomes than men [6,8,12,19]. In a large study (n =1055) involving older adults with stroke, Kim and colleagues [20] found that women had greater disability after stroke. They found that after controlling for age, stroke risk factors, and stroke severity, female gender remained a significant predictor of disability at three months post stroke. The authors suggested that potential variable that may contribute to the worse recovery of women include a significantly higher incidence of post stroke depression [9] and less active treatment for post stroke symptoms [21].

Considering the poorer prognosis for women following acute care for cerebrovascular disease, it is difficult to determine whether these outcomes are due to a lesser potential to benefit from rehabilitation or due to the existing disparity between women and men stroke patients prior to the rehabilitative treatment [22]. Investigating the gains men and women are able to attain during rehabilitation could help to inform treatment decisions in terms of the type, intensity, or length of post-acute interventions for female stroke sufferers. Thus, this study aimed to evaluate whether gender differences exist in post-acute rehabilitation functional gains. Examples of functional goals within the post-acute rehabilitation setting include increasing functional mobility, overcoming cognitive, social or physical barriers, acquiring skills to compensate for memory impairments, participation in social and leisure activities, and returning to work [23,24]. Essentially, the goals of rehabilitation are to return someone to the highest level of independent living within the community. Based on our review of the available literature and the clinical experience of working with our participants, we predicted that there would be a significant gender difference in post-acute stroke rehabilitation outcomes, as measured by Mayo- Portland Adaptability Inventory (MPAI-4) and the Community Integration Questionnaire (CIQ) change scores during treatment. We also hypothesized that significant gender differences would be evident on all of the MPAI-4 subscales.

Method

Participants

This is a retrospective study which utilized archival data. Participants were comprised of 358outpatients at a Southwestern treatment facility (women= 122, men= 236) who were diagnosed with cerebrovascular accidents (CVAs). Nearly all participants were within 6 months post stroke. In addition, all participants were consecutive referrals for treatment early after discharge from an inpatient setting. Symptoms severity for male and female participants was very similar as measured by the MPAI-4 Total Score and the Community Integration Questionnaire. Approximately 48% of the sample had thrombotic CVAs and 32% had hemorrhagic CVAs. All patients had CVAs confirmed by neuroimaging. Mean age for the entire sample was 55.5 (SD = 12.6) years, and the mean education level was 17.1 (3.1) with men having a higher level of education (17.8) as compared to women (15.8). Approximately 79% of the sample denied any illicit substance use. Demographic statistics were run for the entire sample and are presented in Table 1.

Table 1: Gender Comparison of Demographic Variables.

Demographic Variables	Women	Men	P
Age	54.8 (14.5)	55.5 (11.4)	0.449
Education-years	15.8 (11.3)	17.8 (14.7)	0.21
Lives w spouse @/or child	0.61	0.74	
Lives with Parent	0.11	7%%	
Lives alone	0.04	0.06	

Note: Living situation data reported as percentage of sample.

Instruments

Mayo-Portland Adaptability Inventory – 4 (MPAI-4): The MPAI-4 is a global assessment of adaptive functioning for individuals with acquired brain injury [25]. This 35-item rating scale assesses three domains of adaptive functioning: physical/cognitive abilities, emotional and interpersonal problems, and community involvement, which are grouped into the following three indices: Ability Index, Adjustment Index, and Participation Index [25]. The inventory has shown to have excellent reliability overall, as well as for all three of its subscales (Cronbach's alpha = .89; [25]). More recent factor and cluster analyses uncovered moderate intercorrelations among the subscales, indicating that these indices may be varying levels of the same broad construct of adaptive functioning [26]. The format of the measure is a 4-point Likert-type rating scale with anchors that are sometimes item specific, but in general are: none = 0 and severe problem; interferes with activities more than 75% of the time = 4 [27]. The Abilities Index comprises of 12 items, which evaluate abilities such as mobility (i.e. problems walking or moving; balance problems that interfere with moving around) or memory (i.e. problems learning and recalling new information; [27]). The Adjustment Index incorporates nine items assessing emotional and behavioral symptoms such as depression (i.e. sad, blue, hopeless, poor appetite, poor sleep, worry, self-criticism) and fatigue (i.e. feeling tired; lack

of energy; tiring easily; [27]). The Participation Index includes items rating aspects of independence (e.g., transportation, self-care, and money management; [27]). Finally, the last section of the inventory, Part D, inquires about pre-existing and associated conditions, such as psychotic symptoms, drug use, and law violations ([27]).

The Community Integration Questionnaire (CIQ): The CIQ is a 15-item self-report measure that can be completed with the assistance of caretakers [28]. The questionnaire consists of three different subscales: Home Integration, Social Integration, and Productive Activity [29]. Both the patient and the informant versions of the CIQ have demonstrated an excellent reliability with coefficients ranging from .83 to .97 [29]. The individual items of the CIQ are formatted as multiple choice questions; with each choice having an assigned score value [29]. The Home Integration Scale includes 5 items evaluating a person's ability to function independently in their home (e.g., "Who usually prepares meals in your household?" and "In your home who does normal everyday housework"). The Social Integration Scale consists of six items assessing the level of social engagement outside of the home (e.g., shopping and leisure activities; [29]). Finally, the four items of the Productive Activity Scale focus on employment, education, and/or training programs.

Procedures

All participants were involved in a post-acute outpatient program that involved treatment twice each week for three months. Most patients in the program received occupational therapy, speech therapy, physical therapy, social work, and neuropsychological services. The composition of care was determined based on intake evaluations of stroke symptoms [30]. Weekly, participants received one hour of neuropsychology and one hour of social work. Physical and occupational therapy varied from 2 to 4 hours per week. Each participant was rated on both the MPAI-4 and CIQ shortly after the admission assessment and again just before their discharge

Results

Comparisons of male and female participant demographics

Because the groups were very different in terms of size, the Levene test for homogeneity of variances was run along with analysis of variance comparisons. Based on statistical comparisons, there was no significant differences between male and female participants mean age or level of education. However, both groups have a high level of years of general education (women = 15.8, men = 17.8) and this may limit the generalizability of findings from this data. Both women and men in this study have similar proportions of types of strokes (ischemic and hemorrhagic).

Gender-based differences in functioning and comparison of change scores

When examining the entire sample MPAI-4 data, statistically significant differences between admission and discharge scores on all MPAI subscales were evident (see Table 2). Men appeared to have a higher level of functioning than women at time of admission, with their MPAI-4 Total Scores significantly lower (women's mean MPAI-4 = 50.7, men's = 42.6, p<.002).

MPAI-4 change scores (ΔMPAI-4) were created by subtracting admission from discharge scores. T-tests were run for ΔMPAI-4 scores across all MPAI-4 dimensions. Women showed significantly more improvement on the MPAI-4 Psychosocial Adjustment dimension and Total Score (see Table 3). To further clarify the MPAI-4 psychosocial finding, admission comparison scores indicated that men had significantly (p<.01) better psychosocial functioning at admission (women = 12.8, men = 9.7). Men also had significantly (p<.01) lower MPAI-4 Psychosocial Adjustment scores at discharge (men = 5.32 vs. women = 7.08), showing better psychosocial adjustment at both time points. Thus, group comparisons showed that men reported significantly better psychosocial adjustment at admission and discharge, but women had significantly larger MPAI-4 psychosocial adjustment change scores (women = 5.72, men = 4.38). The absolute gender difference on this scale is 1.34 points across the 9 item Psychosocial Adjustment scale. Though the homogeneity of variance was large for these groups (likely secondary to large sample size differences), it was not statistically significant. Thus, it does not appear that group size disparity caused the group MPAI-4 differences.

Table 2: Total Sample Mean Scores on MPAI-4 and CIQ at Admission and Discharge.

Admission and Discharge	Total Sample	Woman	Men
MPAI-4			
ADM-Abilities	17.1 (7.1)	18.6 (6.59)	16.0 (7.21)
DCH-Abilities	8.68 (5.8)	9.22 (6.26)	8.28 (5.50)
ADM-Participation	18.2 (6.5)	19.4 (6.36)	17.2 (6.54)
DCH Participation	10.6 (7.4)	10.8 (6.97)	10.2 (7.67)
ADM Adjustment	10.8 (5.3)	12.8 (5.43)	9.78 (4.81)
DCH Adjustment	6.02 (4.4)	7.08 (4.92)	5.33 (3.92)
ADM CIQ Prod	1.86 (15.2)	1.58 (1.02)	1.98 (1.95)
DCH CIQProd	4.83 (15.4)	3.14 (1.71)	5.58 (13.9)
ADM CIQ Soc	6.20 (2.66)	6.38 (2.40)	6.13 (2.77)
DCH CIQ Soc	9.41 (11.2)	7.97 (2.38)	10.06(13.44)
ADM CIQ Home	2.52 (2.50)	2.97 (2.58)	2.34 (2.45)
DCH CIQ Home	5.06 (8.41)	5.00 (1.84)	5.09 (10.1)
ADM CIQ Total	10.1 (4.43)	10.9 (4.82)	9.79 (4.23)
DCH CIQ Total	12.0 (11.3)	16.2 (4.36)	17.3 (13.2)

Note:*Indicates statistical significance at .05 level; † Indicate statistical significance at .01 level.

Table 3: Gender Comparison of MPAI-4 Change (Admission – Discharge) Scores.

Admission and Discharge Measures	Women (n =)	Men (n =)	P value
MPAI-4 Change scores			
Participation	8.59 (5.8)	6.89 (5.8)	0.07
Adjustment	5.72 (4.7)	4.32 (13.3)	.020*
Abilities	9.39 (5.4)	7.74 (5.9	0.07
Total Score	24.1 (14.9)	19.4 (13.7)	.040*
Living Situation	4.73 (1.5)	2.53 (1.5)	.008*

Note:*Indicates statistical significance at .05 level; † Indicate statistical significance at .01 level.

The CIQ gender comparisons showed that there were no significant change score differences between the two groups across any subscales (see Table 4). In fact, mean change scores were small in magnitude. However, it should be noted that the CIQ variables had

Table 4: Gender Comparison of CIQ Change (Admission to Discharge) Scores.

CIQ Change scores	Women	Men	P value
Home Scale	2.97 (5.81)	2.34 (2.45)	0.57
Social Integration	6.38 (2.40)	6.13 (2.77)	0.21
Productivity	3.14 (1.71)	5.58 (13.98)	0.287
CIQ Total Score	16.27(4.36)	17.37 (13.28)	0.24

Note: *Indicates statistical significance at .05 level.

missing data for several participants and this may have diminished the magnitude of gender difference. Anova comparisons between genders found no significant differences on any CIQ subscales either at admission or discharge.

Discussion

Our study investigated potential gender-based differences in effectiveness of rehabilitation for post-acute stroke patients. Specifically, it was hypothesized that MPAI change scores would show significant gender differences. When comparing change scores (see Table 2), women had significantly more change in psychosocial adjustment (MPAI-4) and the MPAI-4 Total Scores. This data partially supports the research hypothesis that there are significant gender base differences in post-acute stroke rehabilitation.

Given the small magnitude of the gender difference (1.34), across 9 items, it is unlikely that this difference represents a clinically significant finding. The more important gender findings in this study concern the significantly lower admission and discharge scores in men, which suggest that women exhibit more difficulty with emotional adjustment after stroke. The fact that women had significantly more difficulty with psychosocial adjustment at the time of admission appears conceptually consistent with those individuals receiving more psychosocial benefits from treatment (greater change scores). As part of initial treatment planning, people with more difficulty with emotional adjustment were more likely to receive more counseling and support for those issues in the post-acute brain injury program [31]. Furthermore, the fact that these individuals made similar gains as males across other MPAI and CIQ dimensions suggests that program responsiveness to these emotional issues is adaptive and may diminish the likelihood of the negative psychosocial issues from adversely affecting other dimensions of adaptive functioning.

The issue of emotional adjustment post stroke is very important prognostically. Post stroke, individuals are at a high risk for developing depressive symptoms with 30 to 50% reaching a diagnostic threshold [31]. Studies have shown that treatment of depression following a stroke facilitates more gains in physical functioning [31]. In addition, stroke research suggests that, in general, increase in positive emotion over a 3-month period is significantly associated with an increased likelihood of functional status recovery [32]. Understanding factors that influence both increases and decreases in positive emotion has implications for stroke rehabilitation programming and quality of life post-hospital discharge.

Although our findings suggest that women may have more difficulty with psychosocial adjustment after stroke and may benefit slightly more from post-acute rehabilitation, in general our data supported far more gender similarities than differences. Our results indicated that both genders can benefit substantially from post-acute CVA rehabilitation on all domains of functioning measured by the MPAI-4and CIQ. As is the case in most research endeavors, some aspects of our study had limitations that may have affected our findings. Specifically, in terms of demographics, this sample, particularly the male participants, reported very high level of education. Furthermore, the rehabilitation in our study did not adhere to a consistent, manualized protocol, thus some variations in the treatment may have affected our results. For example, participants who had significant emotional or psychosocial adjustment issues at admission would likely have received more counseling services during their three months of treatment. Additionally, because gender role responsibilities are different and care giver issues play a role in psychosocial adjustment, ideally it would have been helpful to know more about the participant's support systems. In terms of future inquiries into gender differences in response to post-acute stroke rehabilitation, researchers should evaluate specific intervention techniques, as well as varying intensity and length of rehabilitation treatment, in order to maximize improvements and create gender-specific treatment protocols.

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