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Face-to-face assessment versus tele-assessment of chronic stroke patients: do the results meet the needs?

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ABSTRACT

Aim: Baseline evaluation of stroke patients is valuable to manage the treatment plan. As in the case of stroke evaluation and rehabilitation, in every aspect of healthcare, tele-medicine is growing gradually. The aim of this descriptive study was to explore whether initial tele-assessment of chronic stroke patients is similar to face-to-face assessment in terms of clinical scales.

Material and Method: Thirty-four chronic stroke patients (mean post-stroke duration 21.44±15.47 months; stroke etiology, 58.8% ischemic; hemiplegic side, 52.9% left; mean age 49.24±12.51; 22 males; 12 females) were included in this trial. Firstly, all the patients were evaluated online, and then at the same day they were evaluated face-to-face by the clinical scales including chair stand test, Berg balance scale, Stroke specific quality of life scale, Motricity index.

Results: The findings of the present study revealed that there was no statistically significant difference between tele-assessment and face-to-face assessment for all the scales ($p>0.05$) except chair stand test (mean time to stand: 9.41 secs vs 8.94 secs in tele-assessment and face-to-face respectively; $p<0.013$).

Conclusion: The authors think that tele-assessment could be performed conclusively as well as face-to-face assessment since the clinical scales used in this trial were gross motor and functional tests. These preliminary results may suggest that tele-assessment could be used for initial assessment of the post-stroke patients as a convenient tool in order to ameliorate the continuous care without disruption by location.

Keywords: Activities, daily living, balance, stroke, assessment

INTRODUCTION

Stroke influences many facets of nervous system function unfavorably (1,2) and may cause hemiparesis, other motor and sensory deficits, as well as balance and posture disturbances (1-5).

In order to develop a rehabilitation plan and evaluate the efficacy of treatment, a baseline evaluation of the neurological and physical condition of the post-stroke patient is important. Initial clinical evaluation often utilizes scales to quantify impairment, activity limitations, and participation restrictions (1,6,7). These scales are also useful for follow-up during and after neuro-rehabilitation (1).

Currently, there has been an increase in assessment and follow-up of patients via tele-medicine (8,9). Keeping up with times, there has been an increase in the use of tele-rehabilitation technologies for rehabilitation of patients with neurological problems, and tele-rehabilitation interventions have shown promising results in improving the health of post-stroke patients and supporting caregivers (10,11). Tele-assessment techniques can inform healthcare professionals about the clinical status, improvements of patients, and allows professionals to remotely collect real-time data on patients' progress. Various remote assessment systems have been developed for tele-assessment. Video conferencing system has been shown to be a convenient and reliable method for evaluating patients with neurological symptoms (12,13). In one study, healthcare professionals and participants reported high levels of satisfaction with tele-rehabilitation interventions in post-stroke patients (11).

The aim of this descriptive study was to explore whether initial tele-assessment of chronic stroke patients is similar to face-to-face physical assessment in terms of the above-mentioned clinical rating scales.

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MATERIAL AND METHOD

The study was carried out with the permission of Üsküdar University Non-interventional Researches Ethics Committee (Date: 28.04.2021, Decision No: 2021-08/4). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Oral and written informed consent were obtained from the patients at the beginning of the study.

The number of people to be included in the study was determined as a minimum of 34 by using G*Power 3.1.9.2 software. A total of 34 post-stroke patients were assessed using tele-assessment and face-to-face examination. The inclusion criteria were as follows: 1) chronic stroke for more than six months in consequence of ischemic or hemorrhagic stroke; 2) Brunnstrom motor stage 3 or above; 3) technological competence; 4) volunteer for participation to the study; and 5) literacy. The exclusion criteria were incapacity to cooperate and lack of a person to assist the patient during the tele-assessment.

Clinical scales were initially administered online (tele-assessment) by video conferencing system followed by face-to-face administration on the same day. All assessments were made by the same physiotherapist qualified in neurology. During the tele-assessment, the patient was connected by phone via video conference and the phone was fixed so that the physiotherapist and the patient could see each other. A person was always present to assist the patient during the tele-assessment and helped the patient when needed. Before the assessment, the patients and their relatives were given education and information about the evaluation scales to be applied.

The clinical tests and scales that compared between tele-assessment and face-to-face administration were chair stand test (CST) (1,14-16), Berg balance scale (BBS) (1,17), Stroke specific quality of life scale (SS-QoL) (18), Motricity index (MI) (19).

CST evaluates a patient's locomotor ability and performance including balance, mobility, and risk of fall. The time taken by and individual to sit down and stand up from a chair is measured in seconds. Straight-backed, armless chair was used. The patient was to sit in the chair with non-paretic arm crossed over the chest with the knees at 90 degrees angle, feet on the floor and performed three sit to stands as quickly as possible safely without using arms with five minutes intervals. The mean of three trials used for data analysis (1,14-16).

The BBS assesses balance by having an individual complete fourteen diverse balance and locomotion tasks which are objectively scored by a qualified individual. Participants may obtain a maximum score of 56 indicating good balance (1,17).

SS-QoL evaluates the quality of life of stroke patients via a 49-item questionnaire with varied domains including energy levels, family roles, language, mobility, mood, personality, self-care, social roles, thinking, upper extremity function, vision and work productivity of the patient. Higher scores indicate better quality of life (18).

MI evaluates the motor ability of the upper extremity, lower extremity and trunk in post-stroke patients. Motion is evaluated at all major joints. The highest score of 33 indicates normal strength hile zero score means no movement at all (19).

Statistical Analysis

The analysis of the current data was calculated by PSPP (GNU PSPP 0.10.4-g50f7b7). Distribution of frequency, percentage, mean and standard deviation were utilized as statistical methods. Normality of the data was ensured by Kolmogorov-Smirnov test. Wilcoxon test was used for comparison between tele-assessment and face-to-face. The results were evaluated at the $p<0.05$ statistical significance level.

RESULTS

Relevant descriptive characteristics of chronic stroke patients in the current study are summarized in **Table 1**. The study included 34 post-stroke patients, among whom 22 (64.7%) were men, and 12 (35.3%) were women. Mean age of the participants was 49.24 years, mean Body Mass Index (BMI) was 26.02. Most of the participants were self-employed (32.4%), others were in management (11.8%), retired (11.8%), engineers (8.8%), lawyers (8.8%), shipping (8.8%), housewives (8.8%), students (5.9%), athletes (2.9%). More than half of the patients (52.9%) were university graduates. The stroke etiology was ischemia in 20 patients (58.8%), mean post-stroke duration was 21.44 months, and 52.9% of our participants had left hemiplegia.

Table 2 summarizes the results of the clinical scales of CST, BBS, SS-QoL and MI for tele-assessment and face-to-face assessment. MI of upper extremity, lower extremity and the trunk were similar for both assessments. Although there were numerical differences in BBS, and SS-QoL scores between the two evaluations, the values were not statistically significant ($p=0.18$ and $p=0.72$ respectively, **Table 2**). In contrast, CST score were statistically significant between the two evaluations (mean time to stand: 9.41 secs vs 8.94 secs in tele-assessment and face-to-face assessment respectively; $p < 0.013$, **Table 2**). Participants took longer to complete the chair stand test during tele-assessment.

Table 1. Descriptive characteristics of the chronic stroke patients

Descriptive characteristics	Chronic stroke patients mean±SD
Age (years)	49.24 ±12.51
Gender – n (%)	
Male	22 (64.7%)
Female	12 (35.3%)
BMI (kg/cm2)	26.02 ±3.99
Height (cm)	171.5 ±8.5
Weight (kg)	76.76 ±13.99
Education level – n (%)	
Secondary school	5 (14.7%)
High school	13 (38.2%)
University	20 (52.9%)
Profession – n (%)	
Self-employed	11 (32.4%)
Employee/Managerial staff	4 (11.8%)
Retired	4 (11.8%)
Engineer/Technician	3 (8.8%)
Lawyer	3 (8.8%)
Sailor	3 (8.8%)
Housewife	3 (8.8%)
Student	2 (5.9%)
Athlete (Football player)	1 (2.9%)
Hemiplegia – n (%)	
Right hemiplegia	16 (47.1%)
Left hemiplegia	18 (52.9%)
Stroke etiology – n (%)	
Hemorrhagic	14 (41.2%)
Ischemic	20 (58.8%)
Post-stroke duration (months)	21.44 ±15.47
Brunnstrom upper extremity – n (%)	
Stage 3	14 (41.18%)
Stage 4	5(14.71%)
Stage 5	9(26.47%)
Stage 6	6 (17.65%)
Brunnstrom el – n (%)	
Stage 3	17 (50%)
Stage 4	6 (17.65%)
Stage 5	6 (17.65%)
Stage 6	5 (14.71%)
Brunnstrom lower extremity – n (%)	
Stage 3	10 (29.41%)
Stage 4	2 (5.88%)
Stage 5	8 (23.53%)
Stage 6	14 (41.18%)

Table 2. Results of clinical scales for tele-assessment and face-to-face assessment

Clinical scales	Face-to-face assessment (n=34) mean ±SD	Tele-assessment (n=34) mean ±SD	p value
CST	8.94±3.8	9.41±3.85	0.013
BBS	39.85±16.59	40.18±16.62	0.18
SS-QoL	149.35±39.77	149.09±37.2	0.72
MI			
Upper extremity	62.09±29.74	62.09±29.74	-
Lower extremity	67.88±23.18	67.88±23.18	-
Trunk kontrol test	52.76±10.81	52.76±10.81	-

DISCUSSION

The objective of this study was to explore whether clinical assessments for neurological rehabilitation of stroke patients administered telephonically are similar to performing them face-to-face. Our results show that tele-assessment was as good as face-to-face assessment when measuring BBS, SS-QoL and MI, but not for measuring CST. When the literature was searched, no study could be found on the effectiveness of tele-assessment in stroke. Studies investigating the effectiveness of tele-rehabilitation and comparing it with conventional rehabilitation are at the forefront. In situations when there is limited accessibility to health services, as in the case of the COVID-19 pandemic, tele-medicine including tele-assessment is a necessity, and the certainty about patients' assessment could lead to consistent and accurate follow-up and treatment plans.

Epidemiological studies have shown that the prevalence of stroke increases with age. Turk Boru U et al. (20) demonstrated that mean age of stroke patients was 64±14.8, percentage of male gender was 52%, and ischemic etiology was accounted for 80% of the stroke cases in Turkey in İstanbul. In concordance with this study, our study population of post-stroke patients was 49.24 ±12.51 years, had male predominance (64.7%), and ischemic etiology was accounted for 58.8%.

The recent studies point out the connection between educational level and stroke incidence, recurrence, and mortality. Che B et al. (21) concluded that low level of education gave rise to higher mortality from stroke. Xiuyun W et al. (22) demonstrated that high level of education was related to decline in stroke event. Contrary to this study, approximately 90% of the stroke survivors had high level of education in our study.

Tele-medicine has been used for evaluation, rehabilitation, treatment, diagnosis, and follow-up purposes for the last 20 years in most medical specialties (23-28). The key aim is to take care of the patients irrespective of their accessibility to health care services (23,26). Means of communication in tele-medicine include remote wireless dialog, web portals, mobile applications, and smartphones (23). In this study, video conferencing system was used.

Recent research by Park S et al. (29), has shown that tele-medicine is important for post-stroke patients due to their long-term recovery needs. In this meta-analysis, the authors evaluated the effectiveness of lower extremity-focused tele-rehabilitation interventions on clinical outcomes. This review aimed to both describe and quantitatively assess the effects of tele-rehabilitation interventions poststroke, therefore, they included randomised controlled trials (RCTs) as the primary study design and non-RCT interventional studies.

Observational or descriptive study designs, including cohort studies, case series, case reports and cross-sectional studies were excluded. As a result, authors concluded that function and ability to perform activities of daily living of the post-stroke patients could improve via tele-medicine. Similar to this trial, in our study we found that tele-assessment is comparable to face-to-face assessment in terms of ambulation, balance, mobility, and posture tests which are associated with locomotion.

In another recent study, researchers aimed to summarize and compare the effects of active rehabilitation assisted by new technologies (virtual reality, robot-assisted therapy and tele-rehabilitation) on upper limb function during the subacute and chronic phases of stroke (30). 15 meta-analyses were based on 189 randomized controlled trials, were included in the quantitative analysis. They concluded that rehabilitation assisted with technologies are at least as effective as face to face conventional therapy for patients with stroke. Although we used tele-medicine as an assessment or baseline diagnostic tool, in our study, we found that approximately the same results can be obtained via tele-assessment when compared to face-to-face evaluation in chronic stroke patients.

In biomedical engineering, literature research into tele-health has been rising since the early 2000s, and patterns of tele-health have been reported. Tele-health has been divided into three parts; tele-medicine, tele-healthcare, and e-health education, and tele-assessment is a subgroup of tele-medicine (31). Principally, tele-assessment is an interactive and real-time experience for the medical examiners and the inspected patients (31,32), allowing, visual, auditory, verbal, and even body language dynamics to be achieved by tele-assessment as in the case of face-to-face evaluation (31). Therefore, we were not surprised when we obtained similar results for the evaluation of the post-stroke patients when assessed telephonically or face-to-face in the current study. When we review the literature, tele-medicine studies in stroke patients are mostly tele-rehabilitation studies that include the effectiveness of exercise applications. From this point of view, our study can lead to future studies.

In a systemic review that aimed to summarized the effectiveness and safety of tele-medicine combined with usual care compared to usual care in neurological diseases, 25 RCTs (n=2335) were included: 11 (n=804) on stroke, four (n=520) on Parkinson's disease, three (n=110) on multiple sclerosis, two (n=320) on epilepsy, one (n=63) on dementia, one (n=23) on spina bifida, one (n=40) on migraine, one (n=22) on cerebral palsy and one (n=433) on brain damage (33). Types of tele-medicine assessed were online visits (11 studies), tele-rehabilitation (seven studies), telephone calls (three), smartphone apps (two) and online computer software (two). In another cochrane systemic review by Laver KE et al. (34), aimed to determine whether the use of tele-rehabilitation leads to improved activities of daily living amongst stroke patients when compared with in-person rehabilitation; or no rehabilitation or usual care. They included 22 trials involving a total of 1937 participants, ranged in size from the inclusion of 10 participants to 536 participants. When we examine the studies, similar scales were used as outcome parameter in most of the studies such as Stroke Impact Scale, Quality of Life Scale, 6-Minute Walk Test, Balance and Mobility Scale, Fugl Meyer Assessment. However, it was not clear whether the assessments were carried out in the form of face-to-face or tele-assessment. Similarly BBS, SS-QoL, MI and CST were used as outcome parameters in our study.

We found significant difference in CST evaluation in favor of face-to-face assessment. Since patients stood up 0.47 faster in the face-to-face evaluation. We speculated that from the point of the examiner, there was eye contact separation from the patient to the time counter, disrupting the interactivity, and time elapsed during tele-assessment. Moreover, this may affect all manner of the patient during the movement. However, in the case of face-to-face evaluation, the examiner could find opportunity to closely follow the movement of CST while keeping track of the time. In other words it means that, while the gross motor tests used in tele-assessment give similar results with face-to-face assessment; more sensitive tests needing more attention, for example, requiring second account calculation may not give the same result.

There are some limitations in our study. Although power analysis was performed and the sample size was determined before the study, more reliable results may be obtained with a larger number of patients. Since clinical scales were administered twice on the same day, we did not control for fatigue or learning in the face-to-face assessment and, also the assessments were both time consuming and tiring for the patient. The high level of education of the patient population in our study may have a significant effect on the results. Conducting this study with groups of different socioeconomic status may lead to different results. Studies with groups of different socioeconomic status are recommended as they will increase the power of the study.

CONCLUSION

Initial tele-assessment of chronic stroke patients is comparable to face-to-face physical assessment in terms of the clinical rating scales; therefore, tele-assessment could replace face-to-face physical examination for the initial and follow-up evaluations of chronic stroke patients.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Üsküdar University Non-interventional Researches Ethics Committee (Date: 28.04.2021, Decision No: 2021-08/4).

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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