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COMPREHENSIVE EDUCATIONAL-REHABILITATION APPROACH IN A PERSON POST-STROKE: A CASE STUDY

SVEOBUHVATAN EDUKACIJSKO-REHABILITACIJSKI PRISTUP KOD OSOBE NAKON MOŽDANOG UDARA: PRIKAZ SLUČAJA

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Case Study

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ABSTRACT

A stroke occurs due to a disruption in brain circulation, leading to partial or complete loss of motor, sensory, perceptual, or cognitive abilities. This can result in disability and reduced rehabilitation potential. Therefore, the approach to working with individuals who have experienced a stroke is crucial, adapting to their individual needs in a holistic manner. In this context, the aim of this study was to present a comprehensive rehabilitation approach for an 88-year-old patient following a stroke through the implementation of educational-rehabilitation treatment, achieving gradual improvements in the recovery process. Tests such as the Mini-Mental State Examination, Motor Evaluation Scale for Upper Extremity in Stroke patients, The Barthel Index for Activities of Daily Living, Aphasic Depression Rating Scale, and The Modified Rankin Scale were applied to assess the set goal. The educational-rehabilitation treatment was conducted daily for 45 minutes, for two months within clinical rehabilitation and nine months in home conditions. The treatment was based on the principles of brain neuroplasticity and motor learning, involving cognitive training, motor training, adaptive skills training, relaxation, education and counseling, motivational training, and the promotion of metacognitive abilities. The research data underwent analysis through descriptive statistics, and the findings were visually illustrated in graphical representations. Based on the obtained results, it can be concluded that there is noticeable functional progress in the patient across all evaluated areas.

Keywords: stroke, rehabilitation, educational-rehabilitation treatment

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SAŽETAK

Moždani udar nastaje zbog poremećaja cirkulacije u mozgu, što može rezultirati djelomičnim ili potpunim gubitkom motoričkih, senzornih, perceptivnih ili kognitivnih sposobnosti. To može uzrokovati invalidnost i smanjenje mogućnosti rehabilitacije. Stoga je pristup radu s osobama koje su pretrpjele moždani udar važno prilagoditi njihovim individualnim potrebama na holistički način. U vezi s tim, cilj ovog rada bio je prikazati sveobuhvatan pristup rehabilitaciji 88-godišnje pacijentice nakon moždanog udara kroz provedbu edukacijsko-rehabilitacijskog tretmana i postizanje postupnih poboljšanja u procesu oporavka. U svrhu provjere postavljenog cilja primjenjeni su testovi: Mini-Mental State Examination, Motor Evaluation Scale for Upper Extremity in Stroke patients, The Barthel Index for Activities of Daily Living, Aphasic Depression Rating Scale i The Modified Rankin Scale. Edukacijsko-rehabilitacijski tretman se provodio svakodnevno u trajanju od 45 minuta, dva mjeseca u okviru kliničke rehabilitacije i devet mjeseci u kućnim uslovima. Edukacijsko-rehabilitacijski tretman se provodio svakodnevno u trajanju od 45 minuta, dva mjeseca unutar kliničke rehabilitacije, te devet mjeseci u kućnim uvjetima. Edukacijsko-rehabilitacijski tretman temelji se na principima neuroplastičnosti mozga i motoričkog učenja, uključujući kognitivni trening, motorički trening, trening adaptivnih vještina, relaksaciju, edukaciju i savjetovanje, motivacijski trening te poticanje metakognitivnih sposobnosti. Podaci istraživanja su podvrgnuti analizi putem deskriptivne statistike, a rezultati su vizualno prikazani u grafičkim reprezentacijama. Na osnovu dobijenih rezultata može se zaključiti da je na svim procjenjivanim područjima primjetan funkcionalni napredak kod pacijentice.

Ključne riječi: moždani udar, rehabilitacija, edukacijsko-rehabilitacijski tretman

INTRODUCTION

Stroke is clinically defined as the syndrome of acute, focal neurological deficit associated with vascular injury (infarction, hemorrhage) of the central nervous system. Stroke is the second leading cause of death and disability worldwide (Murphy and Werring, 2020). Consequences following a stroke can manifest as motor, sensory, perceptual, or cognitive deficits, and these impairments can variably impact individual functioning, leading to disability and influencing the potential for rehabilitation (Mercier et al., 2001). Rehabilitation for stroke survivors should be person-centered, aiming to achieve their optimal physical, mental, and social potentials. An individual and holistic educational-rehabilitative approach in stroke rehabilitation covers the complex motor and non-motor consequences of the disease, affecting functional recovery and the quality of life of stroke survivors. The educational-rehabilitative treatment is a significant component of post-stroke rehabilitation, focusing on educating patients and their caregivers about the condition and providing structured rehabilitation interventions in the areas of cognition, motor skills, adaptive abilities, relaxation, motivational training, and metacognitive abilities. The treatment is based on the model and principles of brain neuroplasticity and motor learning (Glinac et al., 2022).

The aim of this paper was to present a comprehensive approach to stroke rehabilitation through the implementation of an educational-rehabilitative treatment with an 88-year-old

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patient. The study documented gradual progress in recovery measured by the Mini-Mental State Examination (MMSE), Motor Evaluation Scale for Upper Extremity in Stroke patients (MESUPES), The Barthel Index for Activities of Daily Living (BI), Aphasic Depression Rating Scale (ADRS), and The Modified Rankin Scale (mRS) at specific time intervals.

MATERIALS AND METHODS

Participants

A patient, 88 years of age, participated in the research. In mid-March 2022, she was admitted for inpatient rehabilitation treatment at the Clinic for Physical Medicine and Rehabilitation of the University Clinical Center Tuzla, Bosnia and Herzegovina, due to severe paresis of the right arm, moderately severe paresis of the right leg, and speech problems. Several years ago, she was diagnosed with breast cancer, underwent a mastectomy on her left breast, and regularly attended oncology check-ups. Additionally, she was hypertensive and had cardiovascular issues. Before the onset of the current illness, she had a positive outlook on life and was fully functionally independent despite her age and existing comorbidities.

In early March 2022, a vascular lesion in the irrigation area of the left middle cerebral artery was confirmed through CT scanning at the Neurology Clinic. This lesion resulted in severe paresis of the right arm, moderately severe paresis of the right leg, transcortical mixed aphasia, and mild central facial paresis. According to information obtained from others, in the initial days after the stroke, the patient slept more, occasionally cried, and refused food and fluids. With intensive care and family support, her quantitative level of consciousness gradually improved, becoming more alert. However, frequent crying episodes, increased resistance to feeding, and a more pronounced depressive affect with a loss of will for cooperation and recovery were observed. A psychiatrist examined the patient and diagnosed an adjustment disorder with a depressive reaction, prescribing Zoloft therapy. The patient does not comprehend questions posed to her nor does she respond, exhibiting paraphasias in her speech, and nominal speech function is completely impaired.

The sixteenth day after the stroke, she was admitted to the Clinic for Physical Medicine and Rehabilitation. Upon admission, she was conscious with a lowered mood, depressive affect, and evident reduction in volitional and instinctive spheres. She is immobile on her own and quickly becomes fatigued. She can sit with maximal assistance and supervision, but cannot maintain balance independently. In motor executive functions, constant verbal stimulation is required, and the range of motion fluctuates. Suspension indicates flexion and extension movements in the right elbow joint. The fingers of the right hand are in semi-flexion, without voluntary motor activity. The right leg is in an externally rotated position. She can actively flex the right knee to about 90° by dragging her foot along the surface with weaker motor control; extension movements are possible in suspension. The right foot is in a plantar flexion position, passively corrected to a neutral position, without the ability to perform voluntary movements. There is hypoesthesia on the right side of the body. Range of motion, tone, trophics, and gross motor strength of the left extremities are age-appropriate. According to the family, sphincter control is maintained, with occasional lapses.

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Design and Procedures

After admission to the Clinic for Physical Medicine and Rehabilitation, the physiatrist examined the patient and recommended an assessment and treatment by an education-rehabilitation specialist. The patient's assessment by the education-rehabilitation specialist was conducted twice, first upon admission to the clinic and secondly upon discharge. The education-rehabilitation treatment was administered once daily during hospitalization, lasting 45 minutes, five times a week, for a period of two months, from March to May 2022. In addition to the education-rehabilitation treatment, the patient underwent physical therapy (individual kinesiotherapy and electrotherapy) and speech therapy.

After completing clinical rehabilitation, the education-rehabilitation treatment continued at home, once daily, lasting 45 minutes, five times a week, for six months, from June 2022 to March 2023. Afterward, the number of education-rehabilitation treatments was reduced to three times a week for the next three months. Breaks in treatment were taken during the annual vacation seasons (summer and winter holidays), each lasting for 2 weeks. At home, the patient did not receive physical therapy or speech therapy, and assessments were conducted during the initial meeting and after 3, 6, and 9 months of home-based rehabilitation.

Educational-rehabilitation treatment

Educational-rehabilitation treatment is one of the therapies utilized within a multidisciplinary approach for patients who have suffered a stroke. It is based on the model and principles of brain neuroplasticity and motor learning, employing a holistic approach. The educational-rehabilitation treatment is essentially multi-component, involving cognitive training, motor training, adaptive skills training, relaxation, education and counseling, motivation training, and encouragement of metacognitive abilities (Glinac et al., 2022).

Cognitive training was conducted with the intention of optimizing the patient's functioning, reducing disability in interaction with the environment, and applying skills acquired in the therapeutic context to daily activities. Restorative and compensatory interventions were used, including exercise repetition, training with various materials, practicing visual-perceptual tasks, and training for using preserved functions to overcome impairments. At the beginning, cognitive training focused on tasks that promote the resolution of functional areas, and then on treatments of higher levels. In the first phase, cognitive training included tasks such as imitation of gestures, imitation of gestures with objects, understanding of gestures, performing simple and complex tasks, identifying body parts, identifying images/letters/numbers, and non-verbal response to questions. For the patient to successfully solve problems, think, and conclude, it was crucial that she visually perceived information in the correct way. In this regard, in the second phase, exercises for visual perception of shapes (visual completion, figure-background discrimination, visual organization), spatial relationships (spatial reasoning, spatial perception, visual imagination), spatial orientation (laterality, direction), exercises for processing visual information speed (perceptual speed, motor response speed) were implemented. In the third phase, tasks were conducted to improve attention and concentration, orientation, tasks of recalling general information,

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visual and auditory memory, sequential thinking, and reasoning. In the fourth phase, reading and writing exercises were carried out.

To encourage voluntary motor activity in the affected arm, a motor reeducation treatment was implemented (Bojanin, 1986), incorporating exercises for the development of basic and advanced motor skills. Additionally, exercises promoting the functional use of the hand in daily activities were conducted. The educational-rehabilitation program encompassed motor skill exercises, such as locomotor activities like throwing, catching, and pushing; perceptual-motor activities crucial for the development of fine motor skills, upper limb coordination, and visuo-motor coordination; a program for tonal equalization and self-reliance. Furthermore, exercises aimed at the functional use of the hand and arm through coordinated activities necessary for moving and handling objects using the hands and arms (pulling, pushing, reaching, manipulation, throwing, catching) were implemented. Additionally, there were exercises to enhance fine motor skills, including coordinated activities of handling objects, lifting, handling, and releasing with one hand, and the use of fingers and thumb (manipulation of small objects).

Progress in cognitive and motor skills was further utilized for the development of adaptive skills, life skills, with the goal of achieving an optimal level of independence in daily life and social skills to attain an optimal level of socialization and behavioral adjustment to circumstances.

To alleviate present mood disturbances, regulate negative emotions, increase energy and productivity, and influence muscle relaxation, relaxation exercises were conducted, including abdominal breathing exercises and calming breath exercises (Born, 2008). A multi-component educational-rehabilitation approach shows promise in individuals who have survived a stroke with resulting mood changes and depression (Glinac and Sinanović, 2024).

Through education and counseling, the patient was provided with relevant information about the illness, encouraged to understand her health condition, and promoted healthy lifestyles (Seyedin et al., 2015). The goal of education and counseling was to empower the patient, improve and achieve better health outcomes (Aghakhani et al., 2012), reduce unpleasant experiences during hospital stays, including lowering pain and anxiety levels (Jafari et al., 2015; Marcus, 2014; Seyedin et al., 2015).

The motivational training aimed to internally inspire the patient and actively involve her in the rehabilitation process, fostering behavioral changes that would drive actions towards improving health. It sought to awaken a desire for change and empower the patient to actively participate in processes leading towards jointly set goals. Some of the techniques used to boost motivation included discussing the patient's life, activities that bring happiness, encouraging confidence in recovery, understanding relationships with professionals, perceiving factors significantly influencing recovery, understanding the patient's role in the rehabilitation process, perceiving the purpose of rehabilitation, discussing feelings, and exploring the kind of life the person desires post-stroke. These discussions were facilitated in three specific ways: setting rehabilitation goals important to the patient, providing information about rehabilitation, and assessing using the patient's cultural norms (Maclean et al., 2002).

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Throughout the educational-rehabilitation treatment, the patient was encouraged to use metacognitive abilities (self-questioning, paraphrasing, explaining, evaluating, thinking out loud, conversations, goal setting, and sub-goal setting). The application of metacognitive strategies could enhance awareness of impaired skills or processes (through self-assessment and self-monitoring), set goals and plans for addressing areas of disability, and improve the ability to perform desired activities (thus reducing disability) (Skidmore, 2011). Training in metacognitive strategies has shown promising results as an intervention that can help individuals with cognitive difficulties actively participate, even "manage," their rehabilitation programs. Numerous studies have demonstrated improvements in awareness of cognitive difficulties, verbal expression, application of metacognitive strategies, and a reduction in performance errors and inappropriate behavior during laboratory tasks in individuals with chronic traumatic brain injury and stroke (Kennedy et al., 2008; McEwen et al., 2010; Cicerone, 2002; Dawson et al., 2009). Therefore, metacognitive strategy training is a promising approach for individuals with cognitive difficulties (Cicerone et al., 2005; Geusgens et al., 2007).

After assessing the patient's difficulties, needs, interests, desires, and symptoms, short-term and long-term rehabilitation goals were defined, and appropriate tasks and interventions were selected. Concurrently with working with the patient, information about difficulties, achievements, and goals was presented to the family (daughter).

Measures

Clinical outcomes were assessed using valid and reliable tools for stroke:

1. Mini-Mental State Examination (MMSE):

The MMSE is utilized for a systematic and comprehensive evaluation of mental status. It comprises 11 questions assessing five cognitive domains: orientation, registration, attention and calculation, recall, and language. The maximum score is 30, and a score of 23 or lower indicates cognitive impairment (Folstein et al., 1975).

2. Motor Evaluation Scale for Upper Extremity in Stroke patients (MESUPES):

MESUPES measures the quality of movements performed by the hemiparetic hand. It consists of two parts: items evaluating the arm and items evaluating the hand. The maximum score on MESUPES is 58 (Van de Winckel et al., 2006).

3. Barthel Index for Activities of Daily Living:

This ordinal scale assesses a person's ability to perform activities of daily living. Ten items are scored, and the final score is calculated by summing the points assigned for each functional skill. This allows the examiner to quantify the patient's functional impairment. A higher score indicates greater independence in performing measured activities of daily living and a higher likelihood of returning home with varying levels of assistance after hospital discharge (Mahoney and Barthel, 1965).

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4. Aphasic Depression Rating Scale:

This questionnaire consists of nine questions that evaluate external symptoms of depression, such as insomnia, weight loss, external signs of anxiety, and fatigue. A higher score indicates more symptoms of depression (Benaim et al., 2004).

5. Modified Rankin Scale:

The Modified Rankin Scale assesses disability in patients who have suffered a stroke and is used to monitor recovery and the degree of permanent disability over time. A score of 0 indicates no disability, 5 indicates disability requiring constant care for all needs, and 6 indicates death (Runde, 2021).

Statistical Analysis

The research data underwent analysis through descriptive statistics, and the findings were visually illustrated in graphical representations. All graphical representations were generated using spreadsheet software, specifically Microsoft Excel version 16.0.

RESULTS

The educational-rehabilitation assessment during clinical rehabilitation was conducted initially (upon admission to the clinic) and finally (at discharge). The patient's achievement results on the initial/final assessment were as follows: MMSE of 0/0, MESUPES of 8/30, BI of 22/33, ADRS of 26/14, and mRS of 5/4 (Figure 1).

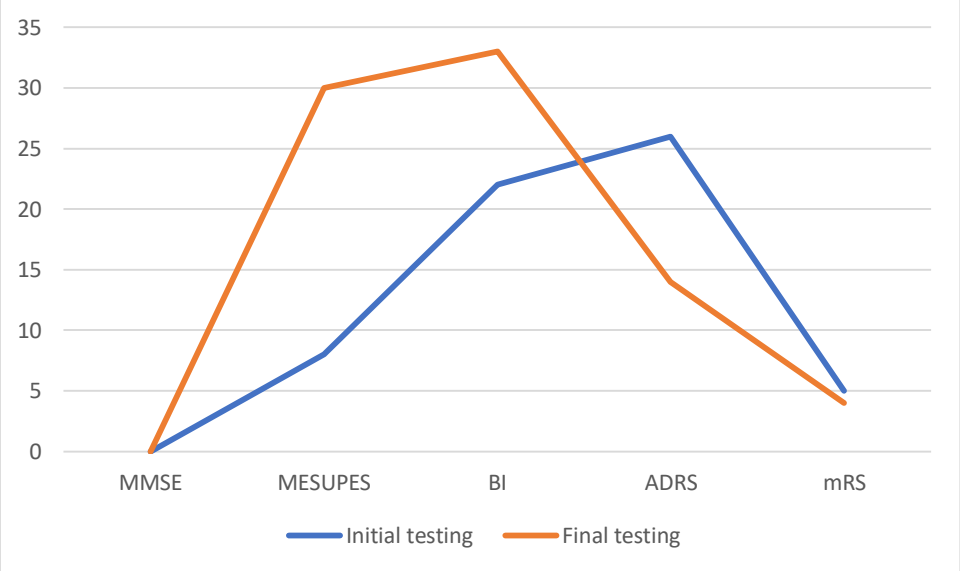

Figure 1. Clinical Measurement Results - MMSE, MESUPES, BI, ADRS, and mRS.

The assessment of achievements after the conducted educational-rehabilitation treatments at home was carried out at four time points (initially, after the third/sixth/ninth month). The assessment results were as follows: MMSE of 0/10/21/26, MESUPES of 30/41/50/58, BI of 33/40/75/96, ADRS of 14/27/10/4, and mRS 4/5/3/2 (Figure 2).

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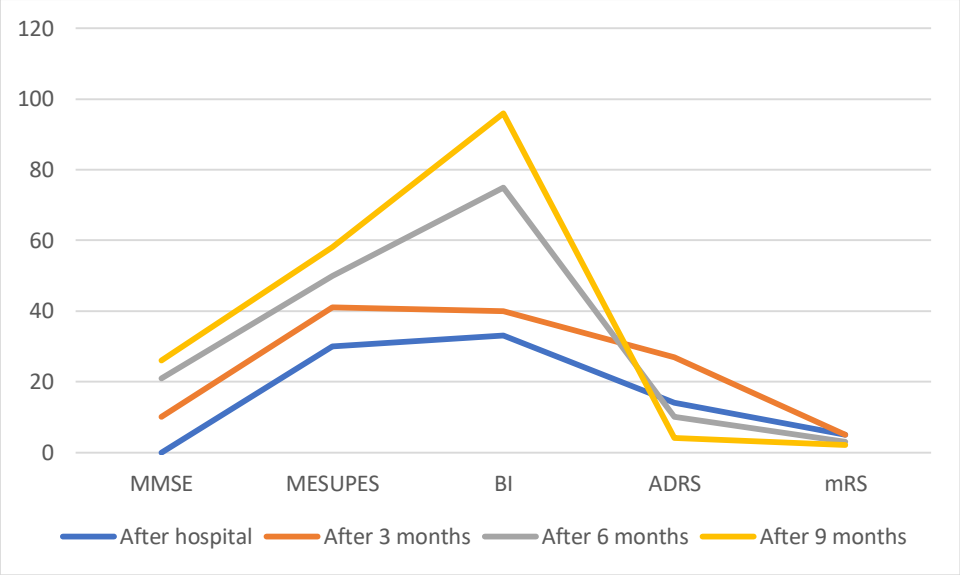

Figure 2. Home-based Measurement Results - MMSE, MESUPES, BARHEL INDEX, ADRS, and mRS.

DISCUSSION

The conducted educational-rehabilitation treatment tailored to the specific needs and abilities of the 88-year-old patient, who suffered a stroke resulting in paralysis of the right side of the body, depression, reduction in voluntary instinctual sphere, and aphasia, enabled her to achieve functional recovery, independence in daily activities, and reintegrate into the social community.

Throughout the two-month clinical rehabilitation, there were slight improvements in the treated areas, but the patient consistently insisted on returning home. She experienced a lowered mood, lacked motivation for recovery, and did not cooperate with the team. A positive relationship between the patient and the educator-rehabilitator was established during the hospitalization.

After the hospitalization concluded, the educational-rehabilitation treatment continued for the next nine months in home conditions. The patient exhibited various symptoms, including crying, refusal of food, aggression towards family members and caregivers, drowsiness, and resistance to exercises. In this phase of rehabilitation, the focus was on motor skills training with continuous verbal stimulation.

The patient underwent various exercises, with a focus on motor training involving active participation and encouragement to increase alertness. As she became capable of independently performing specific activities, her motivation for recovery grew. The exercises were directed towards improving balance reactions while sitting, standing, and walking.

Through regular cognitive training sessions, the patient demonstrated exceptional dedication and motivation. She became independent in many aspects of life, living alone in her apartment, using a cane for outdoor walking, and having no need for assistive devices indoors. Her speech functioned well for socialization, actively participating in social activities, maintaining appearance, enjoying walks, socializing with friends, following series and quizzes, and communicating via Viber with friends.

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After successful educational-rehabilitative interventions, the patient became independent and active in daily activities, contributing to a positive therapy outcome. The family also played a crucial role in the patient's recovery, with their active involvement and support being vital. The patient's recovery was described as a challenging "project" requiring continuous effort from all team members involved in rehabilitation (professionals, family, caregivers, friends). They state that after her recovery, they will no longer accept opinions like, "Nothing can be done here"...

The ultimate goal of stroke rehabilitation is to enable the patient's reintegration into their community and a return to independence. In this case, the patient's journey testifies to the success of rehabilitation efforts.

CONCLUSION

This research confirms the effectiveness of a personalized and holistic approach in the rehabilitation following a stroke, based on the principles of brain neuroplasticity and motor learning. The case of an eighty-year-old female patient post-stroke highlights the potential for recovery and improvement, even in older individuals, through a comprehensive approach in educational-rehabilitative treatment. By integrating cognitive, motor, and psychosocial interventions, significant improvements in functional recovery and quality of life for individuals who have suffered a stroke can be achieved.

These results have practical implications for healthcare professionals in the field of stroke rehabilitation. A multidisciplinary approach to rehabilitation and customization of treatment according to the unique needs and aspirations of each stroke survivor can enhance functional recovery and quality of life. Furthermore, the research emphasizes the need for ongoing rehabilitation, highlighting the importance of encouraging patients and their families to seek continuous support and therapy, even in a home environment, to contribute to the long-term increase in patients' independence and overall well-being.

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