Akreditasi PB IDI–2 SKP

The Effectiveness of Telerehabilitation for Post Stroke Patients

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ABSTRACT

Stroke rehabilitation is an essential component of post-stroke care and is more effective if started sooner. Stroke rehabilitation therapy aims to improve motor function, psychological well-being, cognitively, emotionally, and in terms of social well-being. Telerehabilitation allows communication between medical staff and patients and can be a suitable alternative to usual rehabilitation care in poststroke patients. This method may have potential implications for patients, especially in remote or underserved areas. Future trials are needed on telerehabilitation's feasibility, efficacy, and cost-effectiveness in other low and middle-income countries where the stroke burden is burgeoning.

Keywords: Physical and rehabilitation medicine, stroke, telerehabilitation

ABSTRAK

Rehabilitasi *stroke* merupakan komponen penting dalam tatalaksana pasca-*stroke* dan lebih efektif untuk dimulai lebih awal. Tujuan terapi rehabilitasi *stroke* adalah untuk meningkatkan fungsi motorik, kognitif, emosional, kesejahteraan psikologis dan sosial. Telerehabilitasi memungkinkan komunikasi antara staf medis dan pasien dan dapat sebagai alternatif yang sesuai untuk perawatan rehabilitasi biasa pada pasien pasca-*stroke*. Metode ini mungkin memiliki implikasi potensial bagi pasien, terutama di daerah terpencil atau kurang terlayani. Penelitian masih diperlukan untuk kelayakan, kemanjuran, dan keefektifan biaya telerehabilitasi di negara berpenghasilan rendah dan menengah dengan beban *stroke* meningkat. **Gabrielle Glenis, Regina Caecilia Setiawan, Tresia Fransiska Ulianna Tambunan. Efektivitas Telerehabilitasi untuk Pasien Pasca-*Stroke***

Kata kunci: Rehabilitasi, *stroke*, telerehabilitasi

Introduction

Stroke is one of the most common causes of disability and mortality worldwide;[1] 70% of people experience their first stroke over 65 years of age.[2] Stroke rehabilitation is an essential component of post-stroke care and is more effective the sooner it begins.[3]

Clinical guidelines recommend that stroke survivors with unmet rehabilitation goals have timely access to specialized rehabilitation services because physical function reaches its peak around six months post-stroke and begins to decline 1-year post-stroke.[4-6] Stroke rehabilitation therapy aims to improve the patients' motor function, psychological well-being, cognitively, emotionally, and in terms of social well-being.[7]

Successful rehabilitation depends on stroke severity, rehabilitation team skills, and the cooperation of patients and their families. However, many patients have reduced access to care due to limited regional and logistical resources. These patient groups could benefit from a system that allows a health professional to provide rehabilitation services from a remote location.[8]

Telerehabilitation

Telerehabilitation was defined as "the delivery of rehabilitation services that can eliminate the main barrier cites by patients to participating in supervised rehabilitation postdischarge".[9,10] Home-based telerehabilitation is defined as the use of telecommunication devices (such as telephone, videophone, computer) by a clinician to provide evaluation for disabled persons living at home.[3,11,12] These technologies allow communication between medical staff and patients and the transmission of imaging and other health information data from one place to another.[13] This is consistent with the holistic framework that home-based poststroke telerehabilitation should include support that spans an array of medical, mental health, and other services.[14] The aim is to provide a viable avenue to meet the rehabilitation needs of stroke survivors in resource-limited rural settings in developed countries as well as low- and middle-income

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countries where stroke burden is rapidly escalating.[15,16]

Over the past decade, some randomized controlled trials (RCTs)[20] investigated the benefits of telerehabilitation in post-stroke patients compared to usual rehabilitation methods. The comparable improvement in motor performance in the telerehabilitation and standard care groups was evident on all motor assessment scales. This adds to the reliability of findings that telerehabilitation can produce significant motor improvements.[17] A systematic review by Sarfo, *et al*,[17] showed that telerehabilitation for motor and higher cortical deficits and poststroke depression appears to be as effective as in-person therapies. The routine implementation of telemedicine for post-stroke rehabilitation could be essential for regions worldwide with a lack of socioeconomic resources, including under-resourced areas of high-income countries, where neuro-rehabilitation experts and facilities are virtually non-existent.[18]

Four studies[16-19] aimed to improve stroke survivors' upper extremity function with a virtual environmental-based motor telerehabilitation intervention. Sensors were placed either on the upper extremity (arm/hand) or objects; sometimes, both monitored patients' exercises. The patients' data were transmitted to a hospital-based server. Two monitors, one for the real-time video consultation and one for the virtual environment-based tasks, were used in these systems. Through the video consulting system, the therapist could provide the patient with different tasks and support the patient when needed.[19,20] One system used the ISDN network to link the workstations.[20] In a later publication, an Internet-based broadband connection (ADSL) was used.[20] In total, 63 stroke patients (intervention groups ranging from 5–36 patients) were included in the virtual environment-based motor telerehabilitation studies. The length of interventions varied from 4–6 weeks with a one-hour session five days per week.[19,20] Telemedicine can assist in improving motor function from the onset of stroke, and improved motor performance would further translate into improved activities of daily living.[20]

One telephone-based intervention developed a distant care program for stroke patients discharged home to improve quality of care. Telehealth nurses supported patients (with family caregivers) according to their individual needs, e.g., advised them how to solve and cope with problems themselves. The program consisted of telephone contact and visits to patients' homes. Another telephone intervention aimed to develop and maintain stroke survivors' and their caregivers' social problem-solving skills in home-based settings.[21]

An Internet-based educational intervention aimed to support stroke caregivers living in rural communities. The participants were linked to a customized educational care website giving 'tips of the month' and educational information. They also had the possibility of participating in email consultations with a specialist nurse or rehabilitation team. An email discussion forum that offered caregivers the opportunity to communicate with each other and exchange personal experiences was established.[22]

One study used a real-time video consulting system in a community-based stroke rehabilitation program. The system linked a hospital and a community center for seniors. A physiotherapist gave educational talks and physical exercises and provided participants with psychological support using the system.[3] Video-based techniques may be a key component of effective telerehabilitation.[23] Three studies used 3D motion equipment and software to generate virtual representations of participants' movements.[24-26] Chen, *et al*, combined video conferencing with biofeedback and physiological data from participants to overview intervention parameters.[27]

In another systematic review, 13 RCTs were analyzed. They showed that the telerehabilitation system improved motor function and a significant improvement for activities of daily living, independence and self-efficacy, patients satisfaction or quality of life, and miscellaneous outcome (ROM, power, and spasticity). They proposed significant theoretical advantages for telerehabilitation in addition to/instead of current stroke rehabilitation therapies.[28]

A trial for one year of research followed by 3 to 24 months on poststroke participants provided various views on telerehabilitation. Each received 28 days of telerehabilitation using a system delivered to their home. Each day consisted of 1 structured hour focused on individualized exercises and games, stroke education, and an hour of free play. Each of the 28 days of therapy consisted of 1 required hour of activities selected by the therapist, consisting of arm motor therapy and stroke education. After treatment, there was one optional hour of games chosen by the patient. The system would not operate beyond the permitted number of minutes. The result was very please because it not only improved the strength of the arm but also increased stroke prevention and decreased depression in each participant.[29]

The statement about stroke education in telerehabilitation was supported by other evidence from Palsbo SE,[30] who said that telerehabilitation interventions in stroke care could also be used for educational purposes and support caregivers of stroke survivors living at home. Speech-language pathology evaluation via video consulting instead of face-to-face evaluation is feasible, although no study included in the present review explored this intervention. Speech-language pathology therapies via telemedicine seem to be a promising research area for stroke patients with speech disorders.[30]

Other study[31] included age 45 to 90 years and experienced an ischemic or hemorrhagic stroke within the previous 24 months, doing stroke telerehabilitation (STeleR) intervention consist of three components. First, the three home televisits transpired every 12 to 16 days and were completed within five weeks of randomization. Second, an in-home messaging device (IHMD) was connected to a standard telephone line in the participant's home. and used the Patient Health Questionnaire (PHQ-9) to screen for depression at baseline (week 1–2) and three months.[4,10] Third, five telephone calls were made from the teletherapist to the participant. Calls occurred approximately every 14 days, with the first occurring 7 to 10 days after Televisit 1. The other group is the UC group, with participants that were not contacted by study personnel. There were no significant differences between the STeleR and UC groups at baseline in the FONEFIM

score. There was a better outcome in STeleR than the UC group in LLFDI (Late-Life Function and Disability Instrument) score. There was bias in this study because of the patient's poor compliance.[31]

The survey on 129 participants showed that more than half sample reported interest and satisfaction in receiving assessments (58.4%), training and exercise programs (64.0%), and education (61.4%) via telerehabilitation.32 The devices that received the most significant amount of interest across the rehabilitation services were computers (72.9% were 'somewhat' or 'very' interested), television (68.7%), and landline telephone (59.4%). Individuals younger than 65 had a greater interest to receive training and exercise programs (78.0% vs. 53.4%), as well as education about stroke rehabilitation (78.0% vs. 49.2%) through telerehabilitation, compared to individuals 65 years of age and older ($p<0.05$). The majority of respondents agreed that telerehabilitation would make them feel more independent (73.3%) and more confident in managing their progress (77.5%), as well as save them money in travel expenses (72.7%). The majority also agreed that they would like to receive rehabilitation in their home environment (84.2%) and agreed that telerehabilitation would make accessing stroke care easier (82.8%).[32,33]

Telerehabilitation has several advantages compared to usual rehabilitation, including easier access, mentoring for disabled stroke patients, and patients' ability to self-record their pain, mood, and activity.[15] The primary benefit of telemedicine in stroke management is that areas with insufficient neurological services can be supported by stroke experts by telephone, via the Internet, or through real-time video consulting, which may improve the quality of stroke care. Other putative advantages are cost-effectiveness (avoidance of patient transport), reducing hospital stay, improving stroke education (used in secondary prevention), better efficiency in implementing rehabilitation service, satisfying patient choice/decision-making, improving functional outcomes, and improving physical health, and reducing caregiver strain.[8,18,33-36]

Many patients released from acute inpatient rehabilitation have limited access to outpatient rehabilitation, especially those who live in rural areas. A wide variety of telemedicine interventions in post-stroke rehabilitation care were identified, and most of them showed promising results.[12] Using telerehabilitation systems, it is possible to provide rehabilitation services in patients' homes or community-based settings. This allows health professionals to monitor patients' health status and to identify conditions that need improvement before an adverse effect occurs.[12] A home-based telerehabilitation system can assess patients for post-stroke complications, educate patients about stroke, and assess risk factor control; thus this system can handle patients holistically.[29]

Unfortunately, several barriers limit the spreading of telerehabilitation. These barriers include administrative licensing, medico-legal ambiguity, and financial sustainability.[39] Another barrier, especially in low-income countries (where telerehabilitation would be most needed), is the lack of technological infrastructure. A cross-sectional study (on 100 stroke survivors) in a Ghanaian outpatient neurology clinic demonstrated that 80 to 93% of patients had a positive attitude towards telerehabilitation interventions. However, only 35% of them had smartphones.[40] Installing rehabilitation software on the computer, laptop or smartphone was the most important thing for the patient and the therapist to build good teamwork among patients, therapist, and patient's caregiver. If one of them doesn't do well, this can have an adverse effect.[41]

Telerehabilitation has limited coverage; for example, telerehabilitation doesn't show positive outcomes in patients with balance problems because they need to be trained assistance to help patients walk. Patients should have a walking bar so patients can hold on to the walking bar while they practice.[28] It also raises challenges for rehabilitation professionals.[42] For example, a key issue facing clinicians is conducting assessments or providing interventions that are typical "hands-on Such an issue speaks to a need to modify current techniques and training, for example, to bypass the need for a hands-on approach and to perhaps instead engage the assistance of a family member or a caregiver.[43]

However, there was also agreement that telerehabilitation would result in fewer in-person interactions with rehabilitation professionals, that these interactions would be missed, and that quality of care might be less than face-to-face. Respondents were divided on their opinion of whether they would not want to discuss sensitive information over technology.[32]

Overall, the studies included in this review involved small populations,[28,29,31,32] thus making it difficult to reach any definite conclusions about the effectiveness of telerehabilitation interventions in post-stroke care. Patients included in telerehabilitation interventions generally suffered from mild impairment after stroke and were living in home settings. Whether telerehabilitation interventions are suitable for patients with heavier impairments is still to be investigated. Most studies showed improvements in the outcome measures used but failed to explain the clinical relevance of these results. Finally, the present review has at least one limitation: reports on telerehabilitation are still comprehensive and general. Further research is needed to focus on telemedicine and stroke care.[12]

Telerehabilitation can be a suitable alternative to usual rehabilitation care in poststroke patients. This may have potential implications for patients, especially in remote or underserved areas. Further development of telerehabilitation networks is essential to overcome these barriers.[42] Future trials on telerehabilitation's feasibility, efficacy, and cost-effectiveness in other low- and middle-income countries where stroke burden is burgeoning are warranted. More extensive, well-powered, longer-term studies are needed to establish the routine utility of telerehabilitation for stroke survivors globally.[22] Moreover, the duration of rehabilitation programs and frequency of follow-up visits or contact with medical staff differed from a study to another. So far, there are no adequate data in the literature about which model or telerehabilitation tool is optimal for these patients, and future head-to-head comparative studies are needed.[9]

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