DERLEME / REVIEW

Telerehabilitation: A Promising Solution for Post-Earthquake Rehabilitation

Telerehabilitasyon: Deprem Sonrası Rehabilitasyon İçin Umut Vadeden Bir Çözüm

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Abstract

Telerehabilitation, the use of telecommunication technologies to provide rehabilitation services to individuals remotely, has emerged as a promising solution for post-earthquake rehabilitation. Earthquakes can cause severe physical and psychological damage, and the affected individuals often require rehabilitation services to recover. However, the traditional delivery of rehabilitation services may not be feasible in post-earthquake scenarios due to the destruction of infrastructure and limited availability of healthcare providers. Telerehabilitation offers a cost-effective and accessible alternative for providing rehabilitation services in such situations. This review article explores the current state of telerehabilitation in post-earthquake scenarios. It discusses the advantages and challenges of telerehabilitation and presents examples of successful implementation in earthquake-affected areas. The article also examines the effectiveness of telerehabilitation in various domains. The article highlights the importance of proper planning and infrastructure for successful implementation of telerehabilitation. It also emphasizes the need for training healthcare providers and patients to effectively use telecommunication technologies for rehabilitation services. The advantages of telerehabilitation, including cost-effectiveness and accessibility, make it a viable alternative to traditional rehabilitation services. However, successful implementation requires proper planning, infrastructure, and training. Further research is needed to explore the effectiveness of telerehabilitation in various post-earthquake scenarios and to address its ethical and legal implications.

Keywords: Telerehabilitation, earthquake, rehabilitation, injury.

Öz

Bireylere uzaktan rehabilitasyon hizmeti sağlamak için telekomünikasyon teknolojilerinin kullanılması olarak tanımlanan telerehabilitasyon, deprem sonrası rehabilitasyon için umut verici bir çözüm olarak ortaya çıkmıştır. Depremler ciddi fiziksel ve psikolojik hasara neden olabilir ve etkilenen bireylerin iyileşmesi için genellikle rehabilitasyon hizmetlerine ihtiyaç duyulur. Ancak, rehabilitasyon hizmetlerinin geleneksel sunumu, altyapının tahrip olması ve sağlık hizmeti sağlayıcılarının sınırlı mevcudiyeti nedeniyle deprem sonrası durumlarda mümkün olmayabilir. Telerehabilitasyon, bu tür durumlarda rehabilitasyon hizmetleri sağlamak için uygun maliyetli ve erişilebilir bir alternatif sunar. Bu derleme makalesi, deprem sonrası durumlarda telerehabilitasyonun mevcut durumunu incelemektedir. Bu makale, telerehabilitasyonun avantajlarını ve zorluklarını tartışır ve depremden etkilenen bölgelerde başarılı uygulama örnekleri sunar. Makale ayrıca telerehabilitasyonun çeşitli alanlardaki etkinliğini de incelemektedir. Makale, telerehabilitasyonun başarılı bir şekilde uygulanması için uygun planlama ve altyapının önemini vurgulamaktadır. Ayrıca rehabilitasyon hizmetleri için telekomünikasyon teknolojilerini etkin bir şekilde kullanmak üzere sağlık hizmeti sağlayıcılarının ve hastaların eğitilmesi ihtiyacını vurgulamaktadır. Maliyet etkinliği ve erişilebilirlik dahil olmak üzere telerehabilitasyonun avantajları, onu geleneksel rehabilitasyon hizmetlerine uygun bir alternatif haline getirir. Ancak, başarılı uygulama uygun planlama, altyapı ve eğitim gerektirir. Çeşitli deprem sonrası durumlarda telerehabilitasyonun etkinliğini araştırmak ve bunun etik ve yasal sonuçlarını ele almak için daha fazla araştırmaya ihtiyaç vardır.

Anahtar Kelimeler: Telerehabilitasyon, deprem, rehabilitasyon, yaralanma.

1. Introduction

Natural disasters such as earthquakes have a detrimental effect on the health and well-being of the affected population. The physical and psychological trauma, loss of livelihoods and property, and displacement can leave a lasting impact on the survivors. Telehealth is increasingly being used as an effective tool for delivering healthcare services to remote and inaccessible areas, including those affected by natural disasters. This review explores the use of telerehabilitation applications after an earthquake and their potential benefits.

1.1. The Impact of Earthquakes on Rehabilitation Services

There are many physical and emotional impacts of natural disasters on individuals, communities, and healthcare systems. Large-scale natural disasters, particularly earthquakes, frequently result in many victims suffering from severe disabling injuries due to their sudden onset and magnitude (1-3).

People with previous disabilities can experience an acute exacerbation of chronic disabling situations, as well as new onset disabling damages, and are at increased risk of harm and death in disasters (3). They face massive barriers to accessible emergency information (particularly those with sensory deficits) and are frequently unable to evacuate from the disaster zone by available means due to a lack of accessible transportation or other necessary assistance, as well as difficulties in accessing shelter services, which would include medical care (3).

Major impairments following earthquakes include long bone fractures, crush injuries, limb amputations, burns, spinal cord injuries (SCI), traumatic brain injuries (TBI), and peripheral nerve injuries (4-8). The existence of swollen feet and legs, musculoskeletal pain, leg pain, muscle cramps, muscle pulls, and fasciitis/tendonitis are previously reported and categorized as minor impairments (3, 9). Kuwagata et al. (10) analyzed the profile of traumatized patients after the Hanshin-Awaji Earthquake in 1995 and reported that of the 2,702 patients, 372 suffered from crush syndrome, 177 had injuries to vital organs, 634 patients had pelvis or spine fractures, 44 had burn injuries, and 42 patients suffered from peripheral nerve injuries. Additionally, of the 177 who had injuries to vital organs, 37 patients had intracranial injuries, and 29 patients experienced SCIs (10). Another study analyzed the rehabilitation needs of the survivors of the Wenchuan Earthquake which occurred in Sichuan Province, China in 2008 and it found that of the 28,008 treated patients, 16,440 survivors had fractures, 255 patients were amputated, 2,614 patients had spinal traumas, 5,204 patients had TBIs, and 3,449 patients had peripheral nerve injuries (11).

Rathore et al. (3) reviewed the literature and analyzed expert opinions related to post-disaster rehabilitation and concluded that natural disasters typically result in a large number of disabling injuries that necessitate extensive medical management, which includes rehabilitation interventions, and the majority of disasters strike low-resource countries where rehabilitation services are underdeveloped, and the burden of new-onset, trauma-related disabling conditions rapidly overcomes and deprives available rehabilitation services. Additionally, the participation of rehabilitation teams in immediate disaster response proven to be effective in managing disabling injuries such as fractures, SCI, TBI, and amputation, among others (3). Rehabilitation after a natural disaster, as well as an earthquake, seems to play a crucial role not only in the management of general health but also in reducing the total costs to the government. Data from the earthquake in Pakistan has demonstrated that implementation of physiotherapy and rehabilitation in the management of survivors with SCI after the earthquake resulted in fewer complications and hospital stays, as well as better health outcomes when compared to not involving it (5, 12). Moreover, the follow-up of SCI and fracture survivors from the Sichuan earthquake revealed that rehabilitation intervention was highly effective in the terms of improvement in daily life activities and other functional outcomes, reducing complications, and gaining improved health-related quality of life (13, 14).

Keeping in mind that earthquakes quickly deplete available rehabilitation services, the use of telerehabilitation may be a promising tool option in the management of disaster-related health problems.

1.2. The Background of Telerehabilitation

Rehabilitation is an old field in medicine, but new telecommunication-based practices have emerged all over the world in recent years. Telerehabilitation is the use of telecommunication technology to deliver rehabilitation services remotely to patients who are not physically present in the same location as their healthcare provider (15). The origins of telehealth can be traced back to a century, however, telehealth was not until the advent of the internet and video conferencing technology in the 1990s that telerehabilitation began to gain momentum as a viable alternative and complementary to traditional rehabilitation services (16).

Telerehabilitation involves the use of videoconferencing, mobile devices, and other digital technologies to enable patients to access care from their homes or other remote locations. Telerehabilitation services can include physical therapy, occupational therapy, speech and language therapy, and psychological counseling (17).

Telerehabilitation can be used to care for inpatients, transferring them home after the acute stage of a disease in order to reduce patient hospitalization time as well as expenses to both individuals and healthcare professionals (18). Telerehabilitation enables the treatment of acute diseases by replacing a face-to-face approach in patient-rehabilitator interaction with the conventional face-to-face approach. Eventually, it can be used in situations where patients find it difficult to travel to traditional rehabilitation facilities located far from where they live (19).

Randomized controlled trials on rehabilitation have shown that treating an injury or disease as soon as possible is vital for attaining satisfactory outcomes in terms of expanding a patient's self-efficacy. Therefore, a rehabilitation program should begin as soon as possible, be as rigorous as possible, be as long as possible, and continue throughout the recovery phase. The initiation time, which should, in general, begin as soon as possible, is a major factor. Even if patients require precise and intensive treatment, the early stages of rehabilitation following the onset of a disease or injury can usually be performed at home by patients. For all

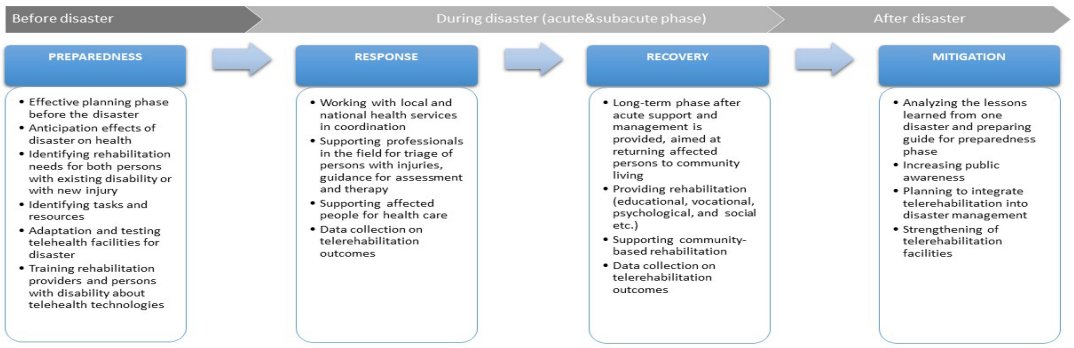

Figure 1. Four stages of disaster management (Adopted from O'Connell C. 2022) (24)

these reasons, telerehabilitation was developed to achieve the same results as traditional rehabilitation in a hospital or face-to-face with a physiotherapist. There have been reports of varying sorts of telerehabilitation treatments, as well as their relative intensities and durations (20). There is a growing body of research demonstrating the effectiveness of telerehabilitation across a wide range of conditions, including neurological, cardiopulmonary and musculoskeletal related conditions (16).

1.3. Telerehabilitation as a Solution After an Earthquake

After an earthquake, many survivors may experience physical injuries or disabilities due to falling debris, structural collapses, and other hazards. In order to minimize impairment and improve outcomes for the injured person, timely rehabilitation interventions are needed (21). Previous studies demonstrated that rehabilitation after unpredicted disasters improved outcomes at both individual and community levels and diminished disability (22). However, disasters such as earthquakes often result in inadequate logistics and access to basic living needs due to the destroyed infrastructure. Additionally, hospitals and healthcare providers in the field may be overwhelmed after a severe earthquake. Hence, telerehabilitation services can help these individuals access timely and effective rehabilitation care, even if they are unable to leave their homes or if there is a shortage of rehabilitation facilities in the affected area (23).

Although the goals of telerehabilitation are the same as in usual situations, the practice may differ according to the possibilities in the field. The primary goals are to manage trauma and prevent secondary complications for the acute phase of a disaster, followed by a holistic approach to functional recovery and community integration (24). However, considering the nature of disasters, it may require a more comprehensive preparation process than usual telerehabilitation. Integrating telerehabilitation into disasters requires motivation and training of providers, appropriate infrastructure, investment, and technical support (25). Given that communications services may be interrupted, it should be prepared with alternative approaches such as creating offline applications and stores in case electricity and other communication tools are not possible (26).

It is crucial to integrate telerehabilitation into the disaster by working in coordination with local and national health systems during an ongoing disaster. Telerehabilitation services can be offered directly to those who need rehabilitation or to providers working in the field as support, such as triage and consultation for assessment and treatment. After acute management, long-term rehabilitation promotes functional recovery, and community integration is needed (24).

In all phases, it is crucial to collect data to facilitate preparedness for potential disasters in the coming future. Analyzing all steps, including persons' needs, developable aspects of telerehabilitation tools, and circumstances in the field should be documented. O'Connell drew a framework by adapting the four stages of disaster management in the context of telerehabilitation (24, 27). This framework was summarized in Figure 1.

1.4. Benefits of Telerehabilitation After an Earthquake

There is limited evidence on the effects of telerehabilitation after a disaster. However, using telerehabilitation principles from the general non-disaster field can inform telerehabilitation approaches in the disaster settings. On the other hand, we know that rehabilitation is a crucial component of patient care after a disaster (22, 28). For example, after the earthquake in Wenchuan, the effects of hospital-based and community-based rehabilitation programs were followed for four years, showing that they improved physical functions (29). Several studies have shown that telerehabilitation services can be as effective as in-person rehabilitation for chronic diseases, pain management, etc. (30, 31). Especially in disaster, it can be more convenient and cost-effective than in-person care, especially in remote or disaster-affected areas where transportation and access to care may be limited (22) Potential benefits derived from other types of telemedicine (teleconsultation, telesurgery, etc.) and expert opinions, although not used very often for rehabilitation, are summarized below (24, 32).

The key benefit of post-earthquake telerehabilitation is providing access to health care after a disaster that creates such a major logistic problem. Thus, remote consultations with rehabilitation professionals who may not be in the field at the time enable the earlier assessment and starting of required interventions. It can relieve the burden of health professionals and hospitals in the field during ongoing disasters. It can also help rehabilitation triage services classify patients according to their health conditions and

needs. After early care and support, ongoing rehabilitation can be provided from home. Therefore, it may help to keep hospitals and rehabilitation centers available for potential needs.

Telerehabilitation services can also provide psychological support to survivors (i.e., telepsychiatry) experiencing post-traumatic stress disorder, anxiety, and depression. These services can be especially valuable for those who may be isolated or unable to leave their homes due to injuries or mobility issues (33). After the earthquake and floods in Pakistan, although without concrete results on the effectiveness of telepsychiatry and educating providers, beneficial effects have been observed (34).

2. Conclusion and Recommendations

The earthquakes and other natural disasters are inevitable. Therefore, to reduce the likelihood of disability-related outcomes from such tragedies, rehabilitation professionals should be better prepared to act quickly, precisely, and in coordination with other relief actors once disasters strike. Telerehabilitation applications can be a valuable tool for providing rehabilitation services and psychological support to survivors of an earthquake. The use of digital technologies can help overcome barriers to access and improve the effectiveness and convenience of rehabilitation care. However, data security and patient privacy should also be considered in telerehabilitation applications. Further research is needed to evaluate the long-term impact and sustainability of telerehabilitation services in disaster-affected areas.

3. Contribution to the Field

To reduce the likelihood of disability-related outcomes from earthquakes, rehabilitation professionals should be better prepared to act quickly and precisely, once disasters strike and telerehabilitation applications can be a valuable tool. This provides an overview on the telerehabilitation as a promising solution for post-earthquake rehabilitation.-

Authorship Contribution

Concept: YE, ZA, TK; **Design:** YE, ZA, TK; **Supervision:** YE, ZA, TK; **Funding:** -; **Materials:** -; **Data Collection/Processing:** YE, ZA, TK; **Analysis/Interpretation:** YE, ZA, TK; **Literature Review:** YE, ZA, TK; **Manuscript Writing:** YE, ZA, TK; **Critical Review:** YE, ZA, TK.

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