



(REVIEW ARTICLE)



Tele-Rehabilitation in Physical Therapy: A Review of Benefits and Barriers

Priti Nathani *

University of Montana, Missoula, MT.

International Journal of Science and Research Archive, 2025, 16(03), 826-833

Publication history: Received on 10 August 2025; revised on 14 September 2025; accepted on 18 September 2025

Article DOI: <https://doi.org/10.30574/ijrsra.2025.16.3.2638>

Abstract

With the help of digital technologies, tele-rehabilitation has quickly found its application as one of the modalities of physical therapy that enables the provider to offer therapeutic services without personal contact with a patient. In this review, the author considers the advantages and disadvantages of tele-rehabilitation in various clinical practices. Peer-reviewed literature backs its efficiency when it comes to the treatment of musculoskeletal, neurological, pediatric, and geriatric issues, frequently achieving similar results to those provided by conventional in-person treatment. The benefits are enhanced access rate, patient independence, cost reduction, and the possibility of monitoring at any time using wearable devices and mobile apps. Nevertheless, there are some impediments to its rampant execution. These comprise digital disparity, the deficiency of internet access, and diversity in the preparation of the clinicians, inconsistency in reimbursement rules, or cause for concerns about anonymous data and wise consent. Adoption is further perplexed by regulatory complexities, especially cross-jurisdictional practice and licensure. The review also points to other ways forward based on the integration of AI, hybrid care models, standardized measures of outcomes, and policy harmonization at a global level. Tele-rehabilitation could be seen as a viable supplement to conventional physical therapy, with its success depending on the strategic investments in building infrastructure, training, and regulatory patterns.

Keywords: Tele-rehabilitation; Physical Therapy; Digital Health; Remote Monitoring; Virtual Care; Patient Accessibility; Health Policy; Data Privacy; Digital Divide; AI in Healthcare; Hybrid Care Models; Outcome Evaluation

1. Introduction

Digitalization has become a major trend in transforming the process of delivering healthcare in the 21st century, as it is improving accessibility, minimizing costs, and even improving clinical outcomes. Tele-rehabilitation is one of these innovations that have become central to the field of physical therapy since it permits patients to access rehabilitation services remotely by the use of telecommunications technologies. The trend towards the greater use of tele-rehabilitation has been spurred by a number of factors, such as health emergencies worldwide, the maturation of the technological infrastructure, and the change in the policies towards the development and integration of digital health.

Tele-rehabilitation refers to the delivery of rehabilitative care through digital technologies such as video conferencing, remote monitoring systems, mobile health (mHealth) applications, and wearable sensor devices. This approach enables patients to access physical rehabilitation services beyond traditional clinical settings, thereby enhancing accessibility and continuity of care. Although it aligns with the broader principles of telemedicine, tele-rehabilitation is specifically tailored to support rehabilitation goals, including motor function recovery, pain management, muscular strength enhancement, and improved mobility. By leveraging these technologies, healthcare professionals can remotely monitor patient progress, provide real-time guidance on therapeutic exercises, and deliver educational support through digital platforms. This integrated approach not only extends the reach of rehabilitation services but also promotes sustained engagement and personalized care pathways for patients undergoing recovery.

* Corresponding author: Priti Nathani

Tele-rehabilitation proves especially useful in the population that has restricted access to face-to-face services, whether geographically, financially, or in terms of mobility. Through the digital platforms, patients and qualified therapists can connect in underserved regions or rural areas. Also, tele-rehabilitation has played a pivotal role in enabling continuity of care in cases of pandemics or natural disasters. The available evidence demonstrates that the outcomes of the treatment of different musculoskeletal and neurological disorders with the use of tele-rehabilitation may be of the same quality as the results of the treatment with traditional methods, with proper introduction of the methods and involvement of patients [1].

Even though it is becoming more widely accepted, the adoption of tele-rehabilitation does not come without a challenge. The implementation of tele-rehabilitation faces several critical challenges that hinder its widespread adoption and effectiveness. Among the foremost barriers are disparities in digital literacy, limited access to reliable internet infrastructure, and unresolved regulatory and data privacy concerns. Additionally, there is a pressing need for comprehensive training programs to equip clinicians with the necessary competencies to deliver care through virtual platforms. These challenges are further exacerbated by inconsistencies in reimbursement policies and the lack of standardized outcome measures across different healthcare systems, which complicates evaluation and scalability. Moreover, remote rehabilitation may not be clinically appropriate for all patient populations or conditions, necessitating careful clinical judgment to determine the suitability of tele-rehabilitation on a case-by-case basis. Therefore, integrating tele-rehabilitation into traditional physical therapy practice requires a balanced and informed understanding of its potential benefits and limitations, ensuring that its application is both effective and ethically sound. The current study is undertaken to review the existing environment of tele-rehabilitation, and highlight its clinical, operational, and patient-centric benefits as well as critically analyze the systemic and individual barriers or challenges that can hamper its usefulness.

2. Technological Framework of Tele-Rehabilitation

Tele-rehabilitation in physical therapy is based on the use of a whole ecosystem of technologies that allow assessing, intervening, and following up on the movement of patients remotely. A central component of the tele-rehabilitation ecosystem is the integration of secure telecommunication platforms, particularly real-time video conferencing software that facilitates direct interaction between clinicians and patients. These platforms enable synchronous communication, which is essential for the delivery of guided therapeutic interventions, immediate feedback, and dynamic clinical assessments. Through visual observation, healthcare providers can evaluate motor function, gait patterns, and other biomechanical parameters in real time, allowing for personalized adjustments to treatment protocols. The interactive nature of these platforms not only supports clinical accuracy but also fosters patient engagement, adherence, and therapeutic alliance within a remote care environment.

There are also asynchronous modalities found in modern tele-rehabilitation that which patients get pre-recorded exercise instructions, educational materials, and electronic reminders via mobile applications. Such systems are quite effective in facilitating self-management as well as compliance, especially in a situation where a person is dealing with a chronic condition. Additionally, the popularity of mHealth applications has been achieved through tailored-made rehabilitation regimens, combined with progress-monitoring features and programmed interfaces that build upon the relative digital proficiency of the user.

One of the keys to tele-rehabilitation is a wearable sensor and Internet of Things (IoT) device or devices, including inertial measurement units (IMUs), accelerometers, and gyroscopes. These gadgets record biomechanical information such as range of motion, angles of joints, and the patterns of movements. The data transmitted by these sensors is frequently analyzed utilizing machine learning to gauge compliance and performance so that therapists can change protocols accordingly [2]. This hardware and analytics make remote rehab programs more accurate and responsive.

Tele-rehabilitation platforms should also guarantee the security of data and ensure they respect the privacy of certain patient data, especially on sensitive health information. To retain patient trust and be compliant with the law, encryption standards, adherence to such regulatory frameworks as the Health Insurance Portability and Accountability Act (HIPAA) in the United States or the General Data Protection Regulation (GDPR) in Europe, and secure cloud storage systems are imperative [3]. Interoperability is the other aspect of the technological framework, which is the ability of tele-rehabilitation systems to work with electronic health records (EHRs), clinical decision support tools, and hospital information systems. Successful interoperability can help smooth data exchange between providers of care, allow multidisciplinary efforts, and eliminate the overdocumentation of clinical data. It is also possible to monitor quality and evaluate outcomes on a systemic basis through interoperability [4, 5].

Artificial intelligence (AI) is also under investigation with the aim of customizing the tele-rehabilitation programs by analysing patient data to make future predictions, prescribe exercises, and provide automatic feedback. Although being an emerging sector, AI-enhanced tele-rehabilitation systems can broadly increase efficiency, decrease therapist workload, and make the care plan more individualized. Such developments, however, are vigorously to be tested and morally examined before general use is accepted. All services of tele-rehabilitation find their basis in reliable internet connectivity and the right access to hardware. The absence of digital access has been quite a barrier in regions with inadequate broadband infrastructure or in economically poor populations. This digital divide should be overcome in order to deliver tele-rehabilitation fairly to urban, rural, and low-resource locations [6].

The technology that supports tele-rehabilitation is still changing fast, and new tools are coming up to support the historical gaps with regard to the issues of access, fidelity, and customization. But it must be implemented carefully to integrate into the work of existing clinicians, have competent tech support, and constant patient/provider feedback to optimize the usability and effectiveness of the technology.

3. Clinical Effectiveness of Tele-Rehabilitation in Physical Therapy

It is necessary to evaluate clinical effectiveness to determine the possibility of tele-rehabilitation acting as an alternative or supplementary solution to physical therapy conducted in person. This argument is gaining weight by the day as it is being used by a wide range of conditions, such as musculoskeletal disorders, neurological dysfunction, post-operative healing, and chronic disease.

Table 1 Clinical Utility of Tele-Rehabilitation Across Patient Populations

Patient Population	Primary Rehabilitation Focus	Key Functional Gains	Adaptation Requirements	Example Modalities Used
Musculoskeletal Disorders	Postural alignment, pain management, and functional movement	Pain reduction, increased mobility, and strength	Home-based exercises, movement coaching	Video-guided physiotherapy, wearables
Post-Operative Recovery	Orthopedic rehabilitation, mobility restoration	Range of motion, joint function, ambulation	Individualized progression planning, milestone tracking	Remote ROM monitoring, telerehab milestones
Neurological Impairments	Motor control, neuroplasticity, balance, speech therapy	Improved FMA and Barthel scores, motor recovery	Therapist-supervised virtual sessions, cognitive interface	VR environments, balance boards, and guided feedback
Chronic Neurological Conditions (e.g., Parkinson's)	Maintenance therapy, tremor control, gait training	Sustained independence, delayed progression	Long-term tracking, motivational support	Mobile apps, sensor-based motion analysis
Pediatric Patients	Motor development, coordination, participation	Improved engagement, functional mobility	Gamification, parental involvement	Interactive games, adaptive learning interfaces
Geriatric Patients	Fall prevention, strength, and endurance	Reduced fall risk, enhanced balance	Simplified UI, adjusted pace for cognitive needs	Resistance training videos, home fitness kits
Chronic Pain Management	Education, pacing, desensitization	Pain literacy, reduced flare-ups, and better activity levels	Behavior reinforcement, psychosocial support mechanisms	Patient-reported outcomes (PROs), asynchronous modules

Numerous randomized controlled trials and meta-analyses have shown that tele-rehabilitation can provide results that are equivalent to face-to-face therapies at least in such areas as low back pain, knee osteoarthritis, and post-total knee arthroplasty [7]. In orthopedic rehabilitation, it aids the facilitation of critical milestones, including the range of motion and ambulation, and it lowers cost implications and travel responsibilities [8]. Remote motor training and speech therapy have been effective in stroke rehabilitation, especially neurologically, where Fugl-Meyer and Barthel Index scores have improved [9]. In chronic diseases such as Parkinson's disease, continuous distant interaction can assist in preserving and retarding the disease, frequently by means of mobile apps and wearables [10]. The pediatric programs on gamified platforms have increased the engagement of children with developmental disorders, and home-based routines focused on fall protection and stamina training have helped the elderly patients. These are more effective interventions with compliance and functional improvements, and they need to be modified due to cognitive or sensory restrictions [11, 12].

Other factors that determine efficiency include access to technology, patient involvement, care delivery aid, and clinician preparedness. There are treatment techniques that are more specific and are not very remote-friendly, such as hands-on or equipment-based; in such instances, hybrid models are a viable alternative. As the spectrum of use and diversity of clinical objectives is broad, it is useful in assessing tele-rehabilitation strategies according to patient groups and their different therapeutic requirements; a Comparative table of the Tele-rehabilitation applications is presented in Table 1.

4. Patient-Centered Benefits of Tele-Rehabilitation

The usage of tele-rehabilitation in physical therapy has mainly been facilitated because of the necessity to increase accessibility, independence, and the reach of patients. Its positive patient-centered effects are emphasized in many studies, especially its benefits concerning enhancing care access, maintaining its continuity, and promoting self-management with chronic diseases.

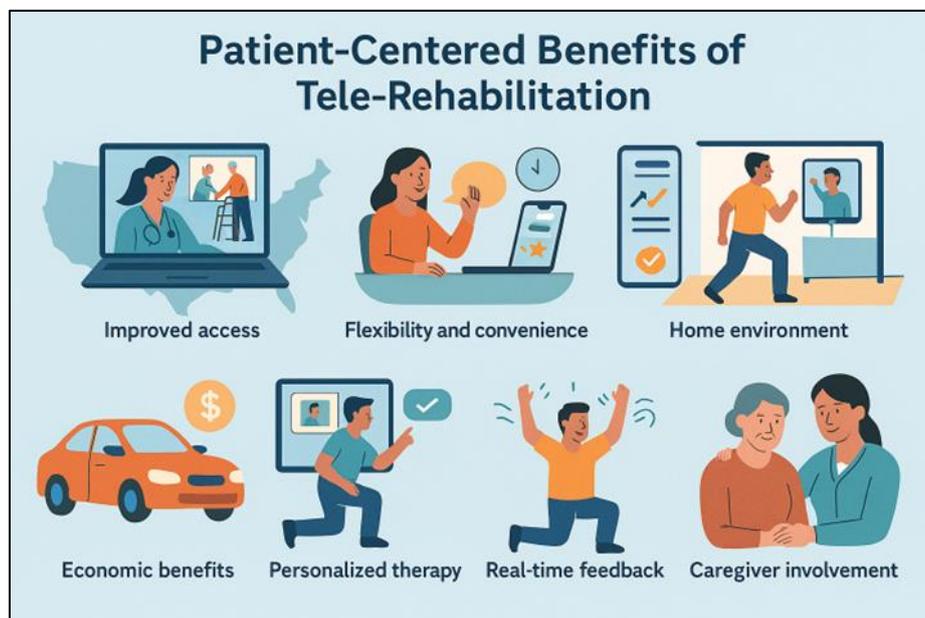


Figure 1 Key Patient-Centered Benefits of Tele-Rehabilitation

Among the most frequently mentioned benefits is access to more people in rural or underserved locations who can be geographically isolated, encounter high transportation expenses, and have limited providers to deliver care. These barriers are overcome in tele-rehabilitation, where patients engage in therapy at home, and literature depicts better adherence and results [13]. It is also flexible, since patients can arrange the sessions to fit their daily needs and desires. This convenience contributes to the compliance, especially for people having care obligations, employment commitments, or mobility limitations. Comfort and long-term engagement are also facilitated by the environment at home. Digital tools are also advantageous to patients by providing more self-management with educational materials, follow-ups on progress, and targets. Such participation has been associated with better results in conditions such as back pain and osteoarthritis [14]. Psychological benefits can also be seen since sources of stress are minimized due to familiar surroundings, and the outcomes of compliance levels are optimized in case of otherwise anxious or people with

impaired cognition. Tele-rehabilitation became one of the most crucial aspects of care provision during the COVID-19 pandemic because it allows continuing care and limits exposure risk [15].

The gains in the economy are also notable. The decreased travel and use of clinic visits decreases the costs and the time-load, which is essential to the low-income groups. Furthermore, individualized treatment programs that are supported by AI and adaptive algorithms align treatment with personalized goals and advancement and pose an increased level of motivation and clinical success. In short, patient-centered care is supported in the case of tele-rehabilitation as it ensures better access, offers flexibility, and allows empowerment of the individual's experience of rehabilitation. As long as there is support and clinician involvement, it would be a powerful addition or alternative to traditional physical therapy.

The figure illustrates the core advantages of tele-rehabilitation from the patient's perspective, including improved access to care, scheduling flexibility, comfort of the home environment, cost savings, personalized therapy plans, real-time feedback, and increased caregiver involvement.

5. Barriers to Effective Implementation of Tele-Rehabilitation

The possibilities of the integration of tele-rehabilitation seem bright, even though the experiment with its application to the mainstream physical therapy has several concerns connected with the technological, clinical, regulatory, economic, and cultural spheres. These problems are critical to address to provide equitable and effective care delivery to diverse people. The main barrier is online inequality. Patients, particularly rural, low-income, or older, do not have dependable internet or access to equipment. In one study, more than a quarter of potential users of tele-rehabilitation were excluded because of infrastructure or technical constraints [16]. Internet issues may interfere with sessions, which hurts quality and safety.

Very closely associated is digital literacy. There are still people who face difficulties in using platforms, especially the older population, even when they have access to technology. This may result in disengagement and drop out of therapies in case there is weak training and support. The bad news is that digital training programs are not steady throughout the healthcare environment. On the clinician side, some weaknesses involve the inability to incorporate tele-rehabilitation into existing processes. The absence of interaction with electronic health records (EHRs), scheduling utilities, and billing software may raise the level of administrative work and impair communication. The therapists might also be required to be trained on how to modify assessment methods and treatment methodologies to fit the virtual environment. The big obstacle is still reimbursement. Tele-rehabilitation, or more specifically, asynchronous sessions, is not well defined in the policies of many insurers. This uncertainty leads to a lack of investment, as it is depicted by a cross-national review; hence, the model is not viable in certain regions [17]. Another factor that has been limiting scalability is the legal and regulatory constraints. Cross-border service delivery tends to be restricted by licensing regulations, and more often, strict privacy regulations on data transmission, such as HIPAA, GDPR, and PHIPA, necessitate the use of high-quality encryption and secure storage, which further increase cost and complexity. There are current issues of clinical appropriateness. Although most interventions can be effectively put into a virtual format, as in the case of manual therapies or complex biomechanical evaluations, in-person care is necessary. Therapists should come up with a reasonable clinical judgment to decide on suitability. Active involvement in virtual care is not always constant among patients. Without a clinic organization, compliance can be compromised and particularly in individuals with cognitive setbacks or mental health issues. Physical absence and lack of touch can lower the drive and responsibility. The other challenge is the lack of agreed-upon protocols and outcome measures. Successful models are hard to assess and replicate because of inconsistencies between program design, assessment tools, and progress measures. Quality assurance is important because it is essential to develop evidence-based guidelines. Resistance within the organization also comes into the picture. Tele-rehabilitation can be considered disruptive within the systems whose delivery systems are based on traditional care delivery. An inclusive and sustainable structure in virtual care will require strategic investment in infrastructure, training, regulation, and outreach.

6. Policy and Ethical Considerations in Tele-Rehabilitation

The growth in tele-rehabilitation use in physical therapy comes with both clinical and technological changes, but also with policy and ethical implications. These ones are patient privacy, just access, professional responsibility, parity reimbursement, and cross-border licensure. Such concerns require proper attention to make remote care safe, just, and trustworthy. The question of privacy of data is within the first concerns of the ethical priority, as tele-rehabilitation would imply sharing sensitive data of the health aspect in the digital world. Encryption, secure logins, and access limits are needed to comply with the regulations on data protection, such as HIPAA and GDPR. Patients can be affected by the

fear of data security negatively [18]. Informed consent is also important. The patients need to know about the drawbacks and dangers of distant treatment, such as less hands-on options and possible technical difficulties, and be provided with an option to choose face-to-face care when medically possible. Another problem is that of access equity. Although tele-rehabilitation is a method of widening the reach, others may fall out due to the lack of access to the internet, digital illiteracy, or the required devices. The old adults, non-urban dwellers, and those in the lower income groups are especially susceptible. Such policy interventions as the supply of broadband as well as subsidized devices must be implemented to close this gap [19].

Jurisdictions have inconsistent regulations and thus restrain the scalability of services. In the absence of standard licensure requirements, care providers might be limited in providing care within an interstate or international jurisdiction. Recent temporal exemptions in the context of the COVID-19 pandemic suggested that such rules require permanent alignment. Adoption is also made difficult by reimbursement differences. Disparities or ambiguities in the policies can decrease the willingness of the providers to provide tele-rehabilitation services. In order to facilitate a wider adoption and lead to innovation, coverage should be on a parity basis with in-person sessions [20].

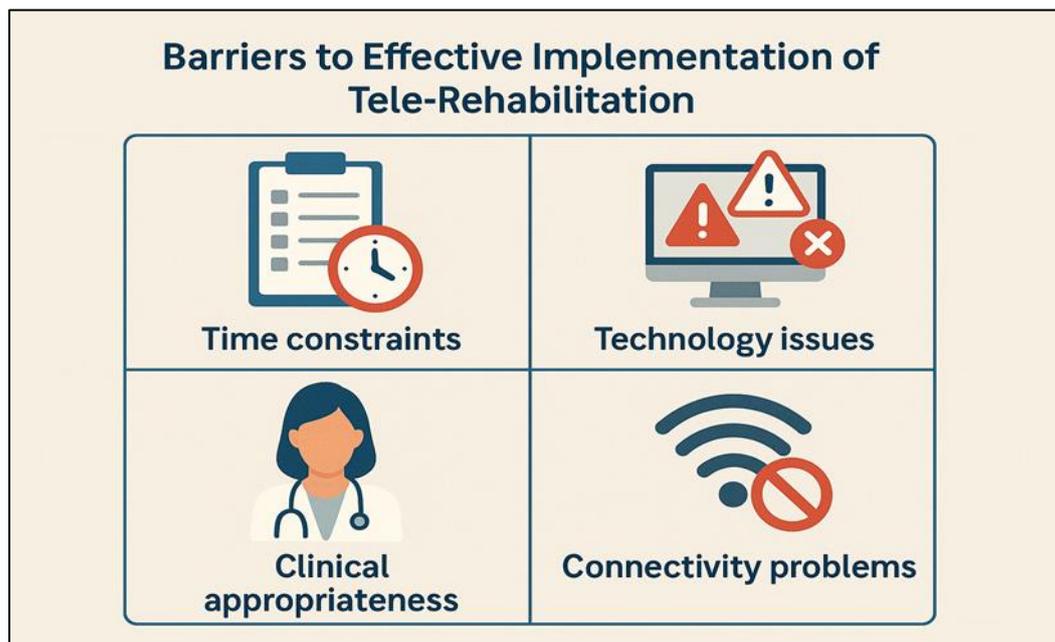


Figure 2 Common Barriers to Effective Implementation of Tele-Rehabilitation

Briefly, tele-rehabilitation needs to be ethical and efficient, which is achieved through thorough, multisided policymaking to meet patient rights, quality, and fairness of digital health provision. The growth of tele-rehabilitation in physical therapy not only brings clinical and technological changes to the arena but also very important policy and ethical consequences. These are patient privacy, equity of access, professional accountability, equality of reimbursement, and cross-border licensure. The challenges need to be addressed in order to achieve safety, fairness, and trust in remote care. Ethical implications also focus on data privacy since tele-rehabilitation includes several exchanges of personal health data over digital media. Data protection laws such as HIPAA and GDPR mandate encryption, strong login, and access procedures. Issues about data safety will adversely affect patient involvement [18]. Informed consent also plays an important role. Patients should understand the constraints and the risks of remote care, such as a lack of direct possibilities and technical problems that can be encountered, and be provided with a choice to receive in-person care where possible. The other challenge is access equity. Although tele-rehabilitation has the potential of improving reach, it also serves to exclude those who cannot use it due to inability to access the internet, lack of digital literacy, or the unavailability of the equipment needed. The most vulnerable populations are elderly adults, rural residents, and those who are lower income. This gap will require blanket policy interventions like the expansion of broadband and the subsidisation of equipment [19]. A lack of uniformity in regulation between jurisdictions restrains the scalability of services. In the absence of standard licensure models, the providers can be inhibited in the delivery of care across state or national lines. The COVID-19 pandemic used temporary waivers to demonstrate the necessity of a long-term alignment of these regulations. Adoption is also complicated by reimbursement disparity. Inequality or ambiguity in policies can decrease the incentive of the providers to provide tele-rehabilitation services. Setting parity reimbursement with in-session activity may facilitate more extensive adoption and innovation [20]. The professional

accountability should also fit the demands of virtual care. There should be instructions on the role of clinicians in remote settings, which should include how to deal with risk mitigation and adverse events. The clinicians need not only to be trained in delivering tele-rehabilitation but also in its ethical aspects. Along with other ethical issues associated with the use of AI in tele-rehabilitation, there are transparency, bias, and algorithmic accountability. Clinicians and developers should make sure that these tools provide the principles of fairness, accuracy, and patient autonomy through documentation and explainability. Patient-centered care has to be at the center. Tele-rehabilitation ought to consider the needs and cultural setting of an individual, but be empathetic as well as keep therapeutic rapport. The latter must retain human aspects in virtual care delivery, and policies should be put in place to ensure this is the case. To conclude, effective and responsible tele-rehabilitation requires a holistic approach to policy-making that should protect the rights of patients, deliver reasonable quality, and advocate for the provision of equitable digital health services.

The figure highlights key challenges that hinder tele-rehabilitation adoption, including time constraints, technology-related issues, limited internet connectivity, and concerns over clinical appropriateness for remote care delivery.

7. Conclusion and Future Directions

Tele-rehabilitation has also become one of the revolutionary methods that present clinical, administrative, as well as patient-centered benefits in the field of physical therapy. It offers an alternative to in-clinic care with the assistance of communication technologies, wearables, and mobile health platforms, being an effective alternative to in-clinic care, especially to people with limitations in geographic location, mobility, or financial means. There are indications that tele-rehabilitation is capable of generating similar clinical outcomes as conventional therapy on musculoskeletal, neurological, and chronic disorders. Patients enjoy better access, lower travelling costs, more comfort, and control over their treatments. Clinicians will be provided with adaptive service delivery and monitoring capabilities, and healthcare systems might be used to more efficiently distribute the available resources and extend the scope of care. Nonetheless, there are still problems of implementation. Digital injustices, inadequacy of infrastructure, and varying levels of tech literacy still leave the vulnerable groups out. There is complexity in the operating environment of reimbursement policies, licensure regulations, and policies on data privacy. Altogether, the field of tele-rehabilitation is about to become a staple technology in contemporary physical therapy. It will only be possible to realize its full potential through concise strides in technology, clinical practice, regulation, and access, so it can be made safe, effective, and equitable to everyone.

References

- [1] Cottrell, M. A., Galea, O. A., O'Leary, S. P., Hill, A. J., & Russell, T. G. (2017). Real-time telerehabilitation for the treatment of musculoskeletal conditions is effective and comparable to standard practice: a systematic review and meta-analysis. *Clinical rehabilitation*, 31(5), 625-638.
- [2] Kairy, D., Tousignant, M., Leclerc, N., Côté, A. M., Levasseur, M., & Telage Researchers. (2013). The patient's perspective of in-home telerehabilitation physiotherapy services following total knee arthroplasty. *International journal of environmental research and public health*, 10(9), 3998-4011.
- [3] Kruse, C. S., Krowski, N., Rodriguez, B., Tran, L., Vela, J., & Brooks, M. (2017). Telehealth and patient satisfaction: a systematic review and narrative analysis. *BMJ open*, 7(8), e016242.
- [4] Irwin, S. A., & Ferris, F. D. (2008). The opportunity for psychiatry in palliative care. *The Canadian Journal of Psychiatry*, 53(11), 713-724.
- [5] Laver, K. E., Lange, B., George, S., Deutsch, J. E., Saposnik, G., & Crotty, M. (2017). Virtual reality for stroke rehabilitation. *Cochrane database of systematic reviews*, (11).
- [6] Dorsey, E. R., & Topol, E. J. (2020). Telemedicine 2020 and the next decade. *The Lancet*, 395(10227), 859.
- [7] Mani, S., Sharma, S., Omar, B., Paungmali, A., & Joseph, L. (2017). Validity and reliability of Internet-based physiotherapy assessment for musculoskeletal disorders: a systematic review. *Journal of telemedicine and telecare*, 23(3), 379-391.
- [8] Pastora-Bernal, J. M., Martín-Valero, R., Barón-López, F. J., & Estebanez-Pérez, M. J. (2017). Evidence of benefit of telerehabilitation after orthopedic surgery: a systematic review. *Journal of Medical Internet Research*, 19(4), e142.
- [9] Chen, J., Jin, W., Zhang, X. X., Xu, W., Liu, X. N., & Ren, C. C. (2015). Telerehabilitation approaches for stroke patients: systematic review and meta-analysis of randomized controlled trials. *Journal of Stroke and Cerebrovascular Diseases*, 24(12), 2660-2668.

- [10] Quinn, L., Busse, M., Khalil, H., Richardson, S., Rosser, A., & Morris, H. (2010). Client and therapist views on exercise programmes for early-mid stage Parkinson's disease and Huntington's disease. *Disability and rehabilitation*, 32(11), 917-928.
- [11] Camden, C., & Silva, M. (2021). Pediatric telehealth: opportunities created by the COVID-19 and suggestions to sustain its use to support families of children with disabilities. *Physical & Occupational Therapy in Pediatrics*, 41(1), 1-17.
- [12] Wagner, T. H., Baker, L. C., Bundorf, M. K., & Singer, S. (2004). Use of the Internet for health information by the chronically ill. *Preventing chronic disease*, 1(4), A13.
- [13] Russell, T. G., Buttrum, P., Wootton, R., & Jull, G. A. (2011). Internet-based outpatient telerehabilitation for patients following total knee arthroplasty: a randomized controlled trial. *JBJS*, 93(2), 113-120.
- [14] Knapp, C., Madden, V., Wang, H., Sloyer, P., & Shenkman, E. (2011). Internet use and eHealth literacy of low-income parents whose children have special health care needs. *Journal of Medical Internet Research*, 13(3), e1697.
- [15] Serper, M., & Volk, M. L. (2018). Current and future applications of telemedicine to optimize the delivery of care in chronic liver disease. *Clinical Gastroenterology and Hepatology*, 16(2), 157-161.
- [16] Molina-Garcia, P., Mora-Traverso, M., Prieto-Moreno, R., Díaz-Vásquez, A., Antony, B., & Ariza-Vega, P. (2024). Effectiveness and cost-effectiveness of telerehabilitation for musculoskeletal disorders: a systematic review and meta-analysis. *Annals of physical and rehabilitation medicine*, 67(1), 101791.
- [17] Cottrell, M. A., & Russell, T. G. (2020). Telehealth for musculoskeletal physiotherapy. *Musculoskeletal Science and Practice*, 48, 102193.
- [18] Appari, A., & Johnson, M. E. (2010). Information security and privacy in healthcare: current state of research. *International journal of Internet and enterprise management*, 6(4), 279-314.
- [19] Bartikowski, B., Laroche, M., Jamal, A., & Yang, Z. (2018). The type-of-internet-access digital divide and the well-being of ethnic minority and majority consumers: A multi-country investigation. *Journal of Business Research*, 82, 373-380.
- [20] Fisk, M., Livingstone, A., & Pit, S. W. (2020). Telehealth in the context of COVID-19: changing perspectives in Australia, the United Kingdom, and the United States. *Journal of Medical Internet Research*, 22(6), e19264.