



The Analysis Study of Home - Based Rehabilitation Program for Stroke Patients: A Comprehensive Systematic Review

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ABSTRACT

Background: Home-based rehabilitation offers a convenient and effective alternative for stroke patients, utilizing telerehabilitation and virtual reality therapy. These therapeutic interventions have shown promising results in improving motor function and daily living activities. However, integrating these programs into standard stroke care requires a comprehensive understanding of their efficacy, safety, and implementation challenges. **Methods:** This systematic review followed PRISMA 2020 guidelines and concentrated solely on full-text articles published in English from 2015 to 2025. Editorials and review articles lacking a DOI were excluded to maintain the integrity of high-quality sources. A literature review was performed using reputable databases such as ScienceDirect, PubMed, and SagePub to identify pertinent studies. **Result:** The initial database search produced more than 600 pertinent publications on the subject. After a thorough three-stage screening process, eight studies fulfilled the established inclusion criteria and were chosen for detailed analysis. Each study underwent a detailed critical evaluation, facilitating an in-depth analysis of the Home-Based Rehabilitation Program for Stroke Patients. This systematic approach ensured that the analysis was based on high-quality evidence, aligned with the study's objectives, and capable of yielding significant insights into this complex association. **Conclusion:** Stroke rehabilitation programs, incorporating telerehabilitation and virtual reality (VR), offer a viable alternative to traditional settings. These technologies improve functional outcomes, but addressing implementation challenges and ensuring equitable access is crucial for maximizing benefits. Future research should focus on user-centered designs and long-term outcomes.

Keywords: Home-Based Rehabilitation, Stroke, Telerehabilitation, VR

INTRODUCTION

Stroke is a leading cause of long-term disability worldwide, necessitating effective rehabilitation strategies to enhance recovery and quality of life for survivors. Traditional rehabilitation often requires frequent visits to specialized centers, which can be challenging due to mobility limitations, transportation issues, and financial constraints.¹ Home-based rehabilitation programs have emerged as a viable alternative, allowing patients to engage in tailored therapeutic activities within the comfort of their own homes.^{2,3} These programs not only offer convenience but also promote greater adherence to rehabilitation protocols, as they can be customized to fit individual schedules and preferences. Moreover, home-based interventions can facilitate the involvement of family members, providing additional emotional support and encouragement to the patient.^{3,4}

Recent advancements in technology have further enhanced the feasibility and effectiveness of home-based rehabilitation.⁵ Telerehabilitation, which utilizes telecommunication technologies to deliver therapeutic services remotely, has shown promising results in improving motor function and daily living activities in stroke patients. For instance, studies have demonstrated that telerehabilitation can be as effective as conventional in-person therapy in enhancing balance and gait abilities.^{6,7}

Similarly, virtual reality (VR) therapy, which immerses patients in simulated environments to practice specific tasks, has been effective in improving balance and ambulation among stroke survivors. These technological interventions not only provide interactive and engaging platforms for rehabilitation but also enable continuous monitoring and real-time feedback, which are crucial for optimizing therapy outcomes.⁸

Integrating home-based rehabilitation programs into standard stroke care requires a comprehensive understanding of their efficacy, safety, and implementation challenges.⁹ Systematic reviews play a pivotal role in consolidating existing evidence, identifying gaps in knowledge, and guiding clinical practice and policy decisions. By analyzing data from various studies, systematic reviews can

assess the overall effectiveness of home-based interventions, compare different modalities, and evaluate patient satisfaction and cost-effectiveness. Such analyses are essential for developing evidence-based guidelines that ensure stroke patients receive optimal care tailored to their individual needs and circumstances.

METHODS

Protocol

This study was meticulously designed in full compliance with the PRISMA 2020 guidelines, ensuring methodological accuracy and a high standard of research quality. Adherence to these rigorous protocols enhanced the transparency, reproducibility, and scientific integrity of the review. Every stage of the process—including comprehensive literature searches, precise data extraction, and systematic synthesis of findings—was carefully executed to minimize bias and uphold analytical rigor. This methodologically robust approach not only strengthens the study's credibility but also reinforces its contribution to the advancement of evidence-based research.

Criteria for Eligibility

This study aims to systematically analyze home-based rehabilitation programs for stroke patients by reviewing and synthesizing data from a broad spectrum of research studies. By identifying key patterns, emerging trends, and gaps in the existing literature, this review seeks to generate meaningful insights that can inform the development of more effective rehabilitation strategies. The ultimate objective is to enhance the understanding of home-based rehabilitation approaches, providing a strong evidence base to support improved patient care and clinical decision-making.

To ensure methodological rigor, the study implemented strict inclusion and exclusion criteria. Only peer-reviewed articles published in English between 2015 and 2025 were considered, with each study's validity confirmed through DOI verification. To maintain a focused and high-quality dataset, non-research materials such as reviews, editorials, and duplicate entries were excluded. This meticulous

selection process enhances the reliability of the analysis, ensuring that findings are derived from credible and relevant sources, ultimately strengthening the study's contribution to evidence-based practice.

By adopting a systematic and comprehensive approach, this study ensures that its conclusions are grounded in robust empirical evidence. The anticipated findings aim to deepen the current understanding of home-based rehabilitation programs for stroke patients, offering a foundation for refining rehabilitation protocols and optimizing patient outcomes. Ultimately, this research aspires to contribute to the advancement of stroke rehabilitation, driving improvements in clinical practice and enhancing the quality of life for affected individuals.

Search Strategy

A comprehensive and systematic search strategy was implemented to identify relevant studies for this review, using key terms such as "home-based," "rehabilitation program," and "stroke patient." To ensure a thorough and well-rounded examination of the topic, the search was conducted across three major academic databases—PubMed, SagePub, and ScienceDirect. This rigorous approach enabled the inclusion of diverse, high-quality sources, reinforcing the strength of the evidence base. By prioritizing methodological precision and scholarly depth, this strategy enhances the reliability and validity of the review's findings, contributing to a more robust understanding of home-based rehabilitation for stroke patients.

Table 1. Search Strategy

<i>Database</i>	<i>Search Strategy</i>	<i>Hits</i>
Pubmed	<i>("home-based" AND "rehabilitation program" AND "stroke patient")</i>	241
Science Direct	<i>("home-based" AND "rehabilitation program" AND "stroke patient")</i>	364

Data retrieval

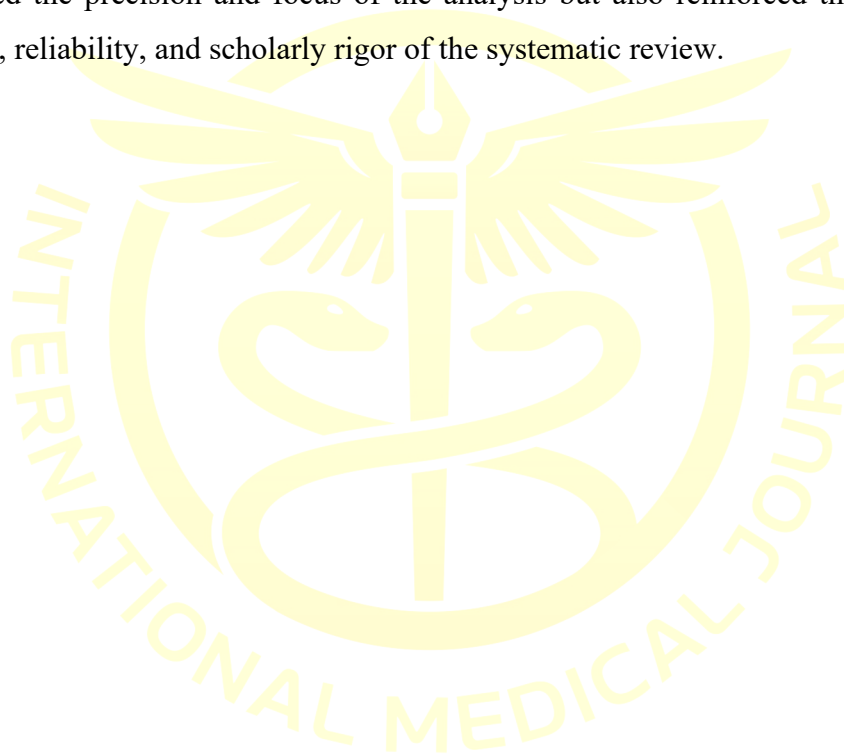
The authors conducted a meticulous preliminary screening of each article, systematically evaluating titles and abstracts to assess their relevance before proceeding with an in-depth analysis. Only studies that aligned with the research objectives and met the predefined inclusion criteria were selected for further review. This structured and methodical approach facilitated the identification of consistent themes and significant patterns across the literature, ensuring that the analysis remained focused on studies directly relevant to the research question.

To ensure uniformity and enhance comparability, only full-text articles published in English were included in the final dataset. A rigorous screening process was employed to verify that all selected studies adhered to the established inclusion criteria and effectively addressed the study's objectives. Articles that did not meet these standards were excluded, thereby maintaining a high-quality dataset that was both precise and aligned with the scope of the research. This careful selection process strengthened the reliability of the review and minimized potential biases.

The evaluation process encompassed a thorough examination of multiple factors, including study titles, authorship, publication dates, research locations, and methodologies. This comprehensive review ensured that only the most relevant and methodologically sound studies were included. By employing a systematic and rigorous selection strategy, the authors enhanced the credibility and robustness of the findings, providing a solid foundation for drawing reliable and actionable conclusions that contribute meaningfully to the field of home-based stroke rehabilitation.

Quality Assessment and Data Synthesis

The authors implemented a meticulous initial screening process, systematically reviewing the titles and abstracts of each article to identify studies that met the predefined relevance and quality criteria. Only those that aligned closely with the research objectives and demonstrated methodological rigor were selected for comprehensive, in-depth analysis. This structured approach ensured the inclusion of high-quality studies that contributed meaningful insights to the review. By refining the selection process, the authors curated a dataset composed of contextually significant and scientifically robust studies. This strategy not only enhanced the precision and focus of the analysis but also reinforced the overall validity, reliability, and scholarly rigor of the systematic review.



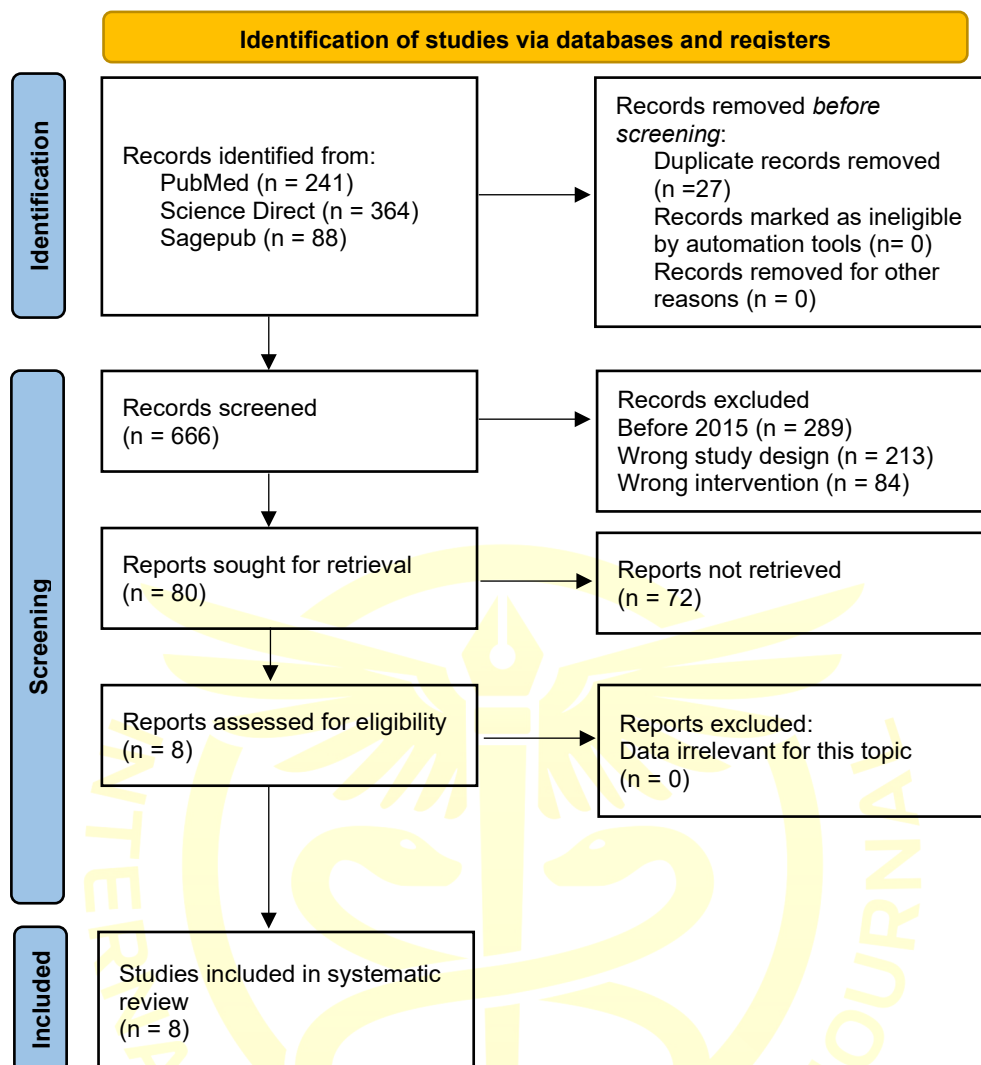


Figure 1. Article search flow chart

Table 2. Critical appraisal of Study

Parameters	(May o et al., 2016)	(Chay ati et al., 2020)	(Kei et al., 2020)	(Lim et al., 2021)	(Bok et al., 2023)	(Chen et al., 2023)	(Forb rigge r et al., 2023)	(Kang et al., 2023)
1. Bias related to temporal precedence Is it clear in the study what is the “cause” and what is the “effect” (ie, there is no confusion about which variable comes first)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Bias related to selection and allocation Was there a control group?	No	No	Yes	Yes	No	No	No	Yes
3. Bias related to confounding factors Were participants included in any comparisons similar?	No	Yes	Yes	Yes	Yes	Yes	No	Yes
4. Bias related to administration of intervention/exposure Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	No.	Yes.	Yes.	Yes.	Yes.	Yes.	No.	Yes.
5. Bias related to assessment, detection, and measurement of the outcome Were there multiple measurements of the outcome, both pre and post the intervention/exposure? Were the outcomes of participants included in any comparisons measured in the same way? Were outcomes measured in a reliable	No	No	No	No	No	No	No	No
	No	No	Yes	Yes	No	No	No	Yes
	No	Yes	Yes	Yes	Yes	Yes	No	Yes

way?

6. Bias related to participant retention

Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?	No	No	Yes	Yes	No	No	No	Yes
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7. Statistical conclusion validity

Was appropriate statistical analysis used?	No	Yes	Yes	Yes	Yes	Yes	No	Yes
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RESULT

The investigation commenced with a systematic search across reputable academic databases, including ScienceDirect, PubMed, and SagePub, to identify studies relevant to the review. A rigorous three-stage screening process was implemented to meticulously filter and select the most pertinent studies, ultimately narrowing the selection to eight papers that met the predefined inclusion criteria. These studies underwent a comprehensive analysis, with key themes and findings carefully extracted for in-depth examination. To enhance clarity and ensure a structured presentation of the results, the synthesized data is concisely summarized in Table 3, providing a clear and organized overview of the analyzed information.

Table 3. The literature included in this study

Author	Origin	Method	Sample	Result
Mayo et al. ¹⁰ (2016)	Canada	Review	-	Rehabilitation for stroke patients can be managed at home, replacing acute care with early supported discharge (ESD) models. This approach supports ongoing recovery by providing rehabilitation and other services in a community setting. Studies have shown that patients managed at home have

				lower depressive scores, fewer complications, and are more likely to stay at home at 6 months.
Chayati et al.¹¹ (2020)	Malaysia	Systematic Review	27 studies	Stroke survivors benefit from home-based interventions, improving physical and psychological health, motor function, anxiety, and depression. These interventions are safe and effective, offering an opportunity for nursing practice. Nurses can provide innovation and implement long-term care at home, particularly for cases requiring long-term care like stroke.
Kei et al.¹² (2020)	Malaysia	RCT	42 participants	The effectiveness of home-based therapy (HBT) in rehabilitation is crucial for stroke survivors, as it helps maintain functional performance and quality of life. However, evidence on its effectiveness remains limited. This study aims to assess the effectiveness of post-discharge HBT on functional outcomes, self-efficacy, and anxiety levels among stroke survivors, enabling rehabilitation professionals to design effective discharge care plans.
Lim et al.¹³ (2021)	Korea	RCT	17 participants	Rehabilitation for stroke patients involves high costs and poor continuity of care. Home-based programs have been developed to improve postural balance, walking, and quality of life. HBP has shown positive benefits in improving walking abilities and postural balance, compared to clinic-based programs.

				This study highlights the importance of home-based rehabilitation in stroke recovery.
Bok et al.¹⁴ (2023)	Korea	Systematic Review	10 studies	Virtual reality home rehabilitation is highly effective for physical function, surpassing other rehabilitation technologies. A pre-structured, tailored program applied to the upper limbs is effective for both physical function and psychological outcomes, with the greatest effect size observed in the upper limbs.
Chen et al.¹⁵ (2023)	Taiwan	Retrospective Study	112 participants	Home-based rehabilitation significantly improved QOL scores for PAC stroke patients, with hospital-based patients showing better improvement in mobility, self-care, pain/discomfort, and depression/anxiety. Factors such as MRS score and participant's age contributed to the improvement, despite lower intensity and duration.
Forbrigger et al.¹⁶ (2023)	Canada	Review	-	Rehabilitation for stroke survivors post-discharge has increased due to the COVID-19 pandemic. Home-based stroke rehabilitation mechatronics, including robots and sensor mechanisms, could improve access to therapy. However, many designs do not specify target users'

				function or impairment, or target therapy activity. Future designs should include stakeholder involvement, provide patient position information, and clearly link features to users' needs.
Kang et al. ¹⁷ (2023)	Korea	RCT	120 participants	Stroke rehabilitation is a continuous process that requires consistent effort. Virtual reality exergame training (VRET) is increasingly used in stroke rehabilitation to improve physical, social, and psychological outcomes. Home-based VRET may be a more convenient option for stroke patients. A study aims to determine the effectiveness of home-based VRET for patients discharged from the hospital, assessing cardiopulmonary endurance, muscular strength, functional capacity, gait, daily activities, and quality of life.

DISCUSSION

Home-based rehabilitation programs have become an essential component in the post-stroke recovery process, providing an effective alternative to traditional inpatient rehabilitation. These programs allow stroke patients to receive individualized therapeutic interventions in their home environment, which can enhance treatment adherence, increase patient comfort, and facilitate long-term

functional recovery.^{15,18,19} Several systematic reviews have demonstrated that home-based rehabilitation significantly reduces the likelihood of poor outcomes and improves performance in personal activities of daily living.^{11,14} By offering a patient-centered approach, these programs empower individuals to actively participate in their recovery while also reducing the burden on healthcare facilities and caregivers.

The integration of advanced technologies, such as virtual reality (VR), robotics, and gaming devices, has further enhanced the effectiveness of home-based rehabilitation.^{5,20} VR-based rehabilitation, in particular, has shown substantial benefits in improving motor function, especially in upper limb rehabilitation for stroke survivors. The immersive and interactive nature of VR engages patients in therapeutic exercises, increasing motivation and adherence to rehabilitation programs. Additionally, robotic-assisted rehabilitation has demonstrated promising outcomes in improving motor control and neuroplasticity, further supporting the potential of technology-driven interventions in home-based settings.^{14,20} The incorporation of these innovations represents a transformative shift in rehabilitation paradigms, enabling stroke patients to access high-quality therapy from their homes.

Despite these advantages, several challenges hinder the widespread implementation of home-based rehabilitation technologies. A recent study examining the factors affecting the adoption of these interventions among key stakeholders—including healthcare providers, patients, and technology developers—identified concerns related to usability, affordability, and accessibility.^{21,22} Additionally, the need for adequate training for both patients and clinicians remains a significant barrier to effective implementation. Ensuring that rehabilitation technologies are user-friendly, cost-effective, and widely accessible is crucial for their successful integration into routine clinical practice. Overcoming these challenges will require collaborative efforts from policymakers, healthcare institutions, and technology developers to establish standardized protocols and provide sufficient support for users.

Telerehabilitation has emerged as a promising solution to address some of these barriers by enabling the remote delivery of rehabilitation services through telecommunication technologies.²³ This approach enhances accessibility for patients with mobility impairments, reduces travel-related burdens, and allows for real-time monitoring and feedback from healthcare professionals. Systematic reviews have indicated that telerehabilitation can improve functional outcomes, including activities of daily living and patient independence, while also being a cost-effective alternative to conventional in-person therapy. Additionally, studies suggest that telerehabilitation may be particularly beneficial in rural and underserved areas where access to rehabilitation centers is limited.^{24,25}

CONCLUSION

In conclusion, home-based rehabilitation programs, augmented by technological innovations such as VR and telerehabilitation, present a viable and effective alternative to traditional rehabilitation settings for stroke patients. While evidence supports their efficacy in improving functional outcomes, addressing implementation challenges and ensuring equitable access remain critical for maximizing their potential benefits. Future research should focus on developing user-centered designs, establishing standardized protocols, and exploring long-term outcomes to further validate and refine these interventions.

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