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Impact of intermediate home-based care on functional health of older adults with stroke in low-income and middle-income countries: A systematic review

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Abstract

Background: Intermediate care services are designed to facilitate transition from medical dependence to functional independence, ultimately improving the overall quality of life. Despite the recognized benefits of intermediate care in rehabilitation, data on its impact on functional outcomes for older adults with stroke in low- and middle-income countries are limited. **Objective:** This systematic review aimed to evaluate the effectiveness and outcomes of an intermediate care model among older adults with stroke. **Methods:** This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline. Scopus, EMBASE, PubMed, CINAHL, MEDLINE, Google Scholar, and reference lists of manually selected articles were searched. Only studies published in English from 2012 to 2023 were included. Randomized controlled trials and quasi-experimental studies focusing on functional improvement in motor function, activities of daily living (ADLs), and quality of life in older adults with stroke receiving home-based or community intermediate care were considered. Data extraction utilized the PICO framework. Three reviewers independently conducted a critical appraisal and risk of bias assessments, with two additional reviewers resolving any discrepancies. **Results:** Eleven studies from low- and middle-income countries were included. The interventions varied, encompassing exercise programs, therapy sessions, video-based programs, reminiscence therapy, and caregiver-assisted therapy, targeting various aspects of stroke recovery and rehabilitation. The interventions demonstrated positive effects on functional outcomes, significantly improving ADLs and overall quality of life. **Conclusions:** Despite variability in functional outcomes, the study highlights that implementing home-based intermediate care can be crucial for stroke patients in low-resource settings.

Keywords

Alzheimer's disease, cerebrovascular disease, functional health, functional outcome, home-based, LMICs, intermediate care, older adults, quality of life, rehabilitation, stroke

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Introduction

Stroke is a burgeoning public health concern and continues to be a leading cause of death worldwide.[1] It remains the second leading cause of death worldwide, with a projected rise in prevalence.[2] The primary driver behind this surge in stroke prevalence is the aging of the population.[3] While the overall number of people experiencing stroke is increasing, the age-standardized rates have been decreasing. Nevertheless, these rates persistently remain the highest in low-income groups.[4] The Global, Regional, and National Burden of Stroke 2019 report identified high systolic blood pressure, high body mass index, high fasting plasma glucose, air pollution, and smoking as the major contributors to stroke incidence.[4] Aging has a significant correlation with reduced functional gain and poor rehabilitation outcomes in stroke patients.[5]

Cognitive deficit, which is present in approximately 70% of stroke survivors,[6] predicts outcomes in functional dependence.[7] Studies have revealed the close relation of stroke and Alzheimer's disease (AD),[8,9] where the former could act as a leading factor to the latter. In addition to being an important risk factor for AD, stroke, especially of ischemic origin exhibits similar pathophysiological features with AD-associated neurodegeneration.[10] The interrelationship between these morbidities could influence worsened functional capacity of patients.

Recovery from a stroke after hospital discharge presents a considerable challenge for survivors. They must contend with long-term medical conditions characterized by lasting functional impairments, the introduction of multiple new medications, rehabilitation goals, and altered diets from their hospital experience, which represent significant challenges for survivors. More than 50% of patients are discharged directly home after a brief hospital stay without a complete understanding of their residual deficits, which can impact their ability to manage secondary prevention or recovery.[11,12] Prominent issues associated with hospital-to-home care for adults with stroke include fragmented care and poor communication between patients and healthcare providers.[13] Substantial gaps persist in post-acute care, hindering the preparation of older adult stroke patients and their caregivers for secondary risk factor management and recovery.[11,14] These gaps in care and knowledge contribute to poor outcomes. After hospitalization, 25% of stroke patients are readmitted within 90 days,[12] over 25% are not medication persistent,[15] more than 50% do not have their blood pressure under control[16] and patients are sedentary for over 78% of the time[17] with a 73% incidence of falls.[18] Consequently, stroke recurrence remains high, the prevalence of stroke-related disability increases, and it escalates during post-acute recovery.[19,20]

Intermediate care is a range of services designed to facilitate the transition from hospital to home and from medical dependence to functional independence. The primary objectives of care are not solely medical, as the anticipated discharge destination of patients is considered, with the desired clinical outcome being the recovery or restoration of health. Clinicians have widely used intermediate care to enhance stroke rehabilitation in discharged patients.[21,22] Previous intermediate care interventions provided stroke patients with health education, emotional support, physical therapy, and medication reconciliation via telephone follow-up and home visits. Providers offer home-based intermediate care to individuals at home or within their community. Cost and consumer preferences have caused a stroke rehabilitation movement away from institutional home and community-based care.[23] Despite the recent growth in their use as a bridge to care transitions, there needs to be more data on the impact of home-based intermediate care on function-related outcomes in low-income and middle-income countries (LMIC),[24] especially among older people affected by stroke. Therefore, this study aimed to systematically review the effects of intermediate care on the function of older adult stroke survivors in LMIC.

Methods

Study design

A systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines[25] (Figure 1).

This study did not involve human participants. Before the commencement of the study, ethical approval was obtained from the College of Nursing, Midwifery and Health, Research Ethics Panel (No.1325), University of West London and University of Ibadan/ University College Hospital Ethics Committee (No. UI/EC/22/ 0410).

Eligibility criteria

Search strategy. Multiple databases were systematically searched for recent evidence from January 2012 to December 2023. The databases searched were EMBASE, PubMed, CINAHL, MEDLINE, Scopus, and Google Scholar. Additionally, the reference lists of retrieved publications were searched manually to broaden the scope and ensure the inclusion of all relevant articles. The search terms comprised "Stroke," "Functional Health," "Older adult," "Intermediate Care," "Home Based," "Quality of Life," and "Post-Acute Care Stroke rehabilitation." These terms were combined using AND and OR, and some were expanded, especially those with multiple synonyms, to encompass all pertinent articles. Adjustments to the search were made according to the specific requirements of the search engines and databases utilized. The entire search strategy is in Supplemental Table 1.
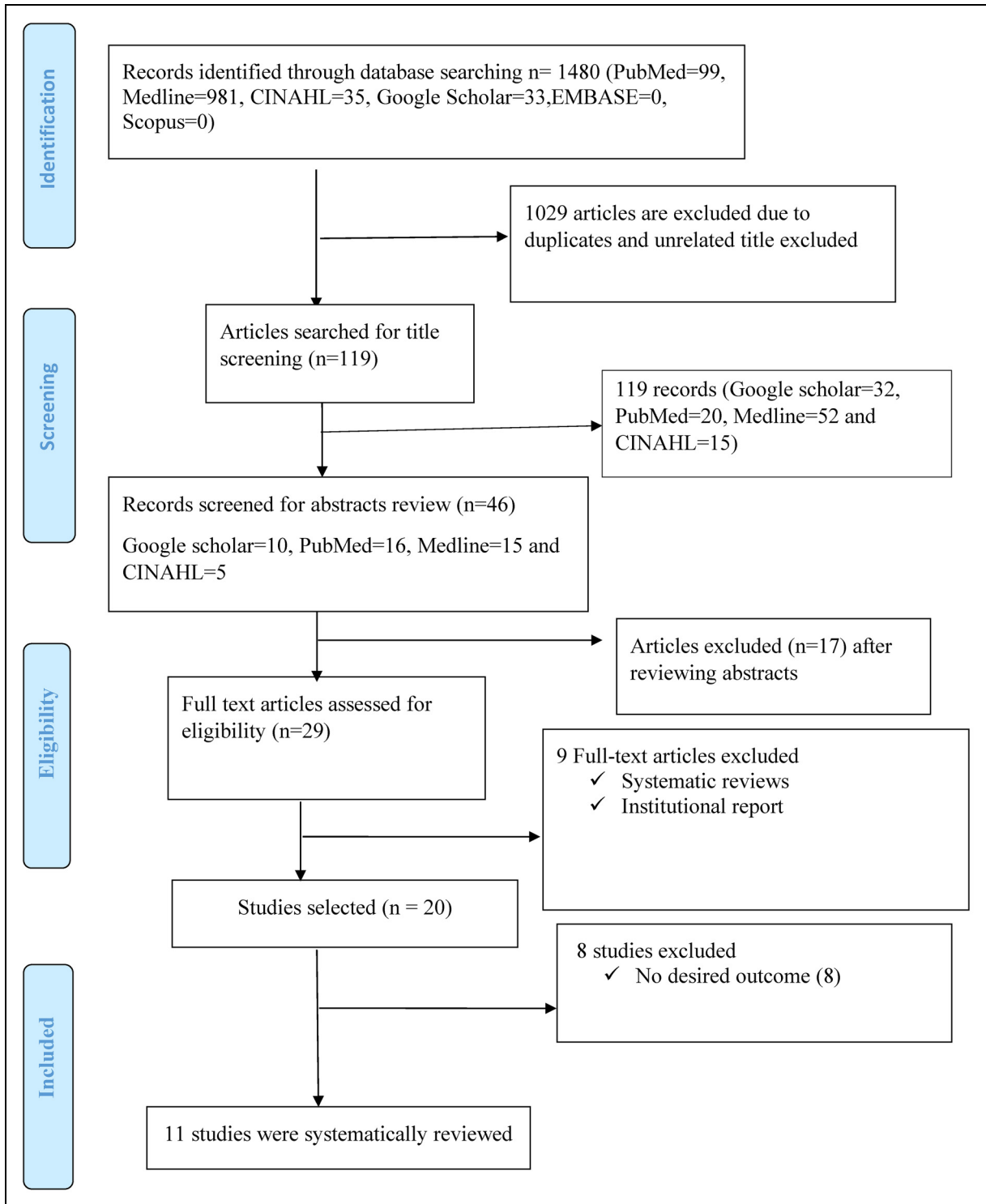
Figure 1. PRISMA flow chart of the study selected.

Study selection and data extraction. TF downloaded all identified citations using the RefWorks referencing software manager (https://refworks.proquest.com/library/). Duplicates were excluded, and the screening process was carried out manually. TF initially conducted the title/abstract and full-text screening. A second reviewer, HK, independently tested a random 10% of all references. TF, HK, and ML independently screened the complete text, and any area of variance was resolved through consensus among the reviewers. RA also provided input on developing the study

Table 1. Studies that met the PICO criteria (participants, interventions, comparators, and outcomes).

Population	Included: Older adult patients with stroke ≥ 60 years (United nation definition of older adult)
Intervention	Intermediate home-based/ Community stroke care
Control	As described in the studies
Outcome	Function or quality of life, measured by psychometrically appropriate measures

methodology. The PICO framework was employed for the search as outlined in Table 1. Inclusion criteria involved intervention studies using the intermediate care model to enhance the functional outcomes in older adult stroke patients, limited to English-language research articles. The study setting was either community-based or home-based. Exclusion criteria encompassed cross-sectional research, animal studies editorials, short commentaries, papers published before 2010, non-peer-reviewed studies and inaccessible full texts.

Study outcomes. Main Outcome: This systematic review aims to assess the effectiveness and pattern of functional outcomes associated with the implementation of the intermediate care model among older adult individuals with strokes.

Quality assessment. TF conducted the quality assessment using the Cochrane Collaboration's technique for assessing risk bias in randomized trials[26] and CASP.[27] HK and ML served as references, checking 40% of the papers and providing alternative perspective clarification was needed on articles.

Critical appraisal. The three non-randomized studies were evaluated using JBI critical appraisal tools for quality assessment and risk of bias.[28]

Data analysis. The table of results was cleaned before analysis, and a quantitative data analysis technique was employed. Descriptive and narrative analysis methods were used for the quantitative data.

Results

Study overview

The search results are shown in Figure 1, along with a synopsis of the papers consulted (PRISMA flow chart). Although the databases contained 1148 research articles, only 11 met the inclusion criteria for this systematic review (Table 1). All articles reviewed were published between 2012 and 2023, with 25% published in 2018. Most (85%) of the studies were randomized control trials, and 25% were conducted in China. A summary description

of eligible papers is presented in Table 2, and Table 3 shows the commonalities and disparities among the selected papers.

Methodological quality assessment

All studies met the criteria of the CASP and JBI non-randomized assessment checklist. However, there are variations in the consideration of the relationship between researchers and participants, ethical issues, and clarity of findings across different studies. The assessment suggests that most studies are of good quality, but researchers should be aware of potential limitations in certain areas (Supplemental Tables 2 and 3).

Risk of bias assessment

The overall risk of bias varied across the studies. Using the Cochrane risk of bias tool, six studies had a low risk of bias across all domains.[26] Two studies (Olaleye and Heish) had a high risk of bias in assigning interventions and measuring study outcomes. It is essential to consider the risk of bias when interpreting the results of such studies. Three other non-randomized studies[28] had a low risk of bias according to the JBI assessment tool (Supplemental Tables 3 and 4).

Existing intermediate home-based care

Nine of the 11 studies highlighted employed randomized controlled trial designs (Table 2). The interventions targeted older adult stroke patients and were administered in a home-based or community-based setting. Various interventions were utilized, including meaningful task-specific training, modified reminiscence therapy, game-based therapy, physiotherapy, mirror therapy, Hospital-Community Integrated Service Model, and Home-based guidance and care activities. Most interventions were delivered by healthcare professionals, including psychologists, nurses, physiotherapists, occupational therapists, community health workers, and multidisciplinary teams (Table 3). Nordin et al.[38] used carer-assisted therapy for intervention delivery. Regular follow-up performed at different intervals is common across intervention studies to ensure intervention adherence and enhance outcomes.

Arya et al.[31] and Hseih et al.[34] employed task-specific training administered by physiotherapists. Arya et al. observed significant improvements in sensorimotor and upper extremity recovery in the intervention group compared with the control group. The intervention group demonstrated superior improvement across all outcomes compared to the control group, including Fugl-Meyer assessment (FMA), $F(1, 100) = 16.34$, $p < 0.001$) at post- and follow-up assessments, and Motor Activity Log-Amount of Use and Quality of Movement $(F(1100) = 56.79$, $p < 0.001$; $F(1100) = 57.09$, $p < 0.001$,

Table 2. Summary description of eligible papers for the systematic review.

Author (year)	Study size	Study design	Country of study	Objectives/Research question	Outcome	Key Findings
Scheffler and Mash, 2019[29]	160	Prospective, longitudinal survey design	South Africa	To describe and analyze the outcomes of patients with stroke from a rural PHC setting in the Western Cape, South Africa.	1. Functioning and independence 2. Caregiver strain 3. Patient and caregiver satisfaction	Outcomes of HCBC for stroke patients and their family caregivers in the Cape Winelands were poor: High dependence levels persisted and were exacerbated by environmental factors and poor assistive-product provision. Caregiver strain remained unchanged, and patient and caregiver satisfaction with services was low. Referral guidelines to HCBC were absent, and referral rates were low. HCBC failed to provide seamless continuity of care following discharge from acute hospital care. Service provision was fragmented, had low intensity and short duration, and did not meet family and caregiver expectations regarding intervention and information needed.
Chaiyawat and Kulkantrakorn, 2012[30]	60	Randomized controlled trial	Thailand	To develop and examine the effectiveness of individual 6-month home rehabilitation program in ischemic stroke patients upon disability and quality of life at two years.	1. The Barthel Index (BI) 2. Modified Rankin Scale provides (mRS)	Early home rehabilitation program in the first six months period after ischemic stroke leads to more rapid improvement in function, reduced disability and increased quality of life than usual care.
Arya et al., 2012[31]	103	Randomized controlled trial	India	To evaluate the effectiveness of meaningful task-specific training (MTST) on the upper extremity motor recovery during the subacute phase after a stroke.	**Primary outcome measures** 1. Fugl-Meyer assessment 2. Action Research Arm Test **Secondary outcome measures** 1. Wolf Motor Function Test 2. Motor Activity Log 3. Amount of use (AOU) 4. Quality of movement (QOM)	The MTST produced statistically significant and clinically relevant improvements in the upper extremity motor recovery of patients with a subacute stroke.

Table 2. Continued.

Author (year)	Study size	Study design	Objectives/Research question	Country of study	Outcome	Key Findings
Olaleye et al., 2014[32]	52	Single-blind randomized clinical trial	To compare the outcomes of physiotherapy intervention on selected indices of recovery for stroke survivors treated at a primary health center group (PHCG) with those treated in their respective places of domicile group (DG).	Nigeria	1. Modified Motor Assessment Scale (MMAS). 2. Short Form-Postural Assessment Scale for Stroke (SF-PASS)	Physiotherapy intervention at the primary health care center and respective homes of stroke survivors similarly improved clinical outcomes. Treatment at any location may enhance access to physiotherapy after stroke in a low-income community like Nigeria.
Choi and Paik, 2018[33]	24	A quasi-randomized, double-blinded, controlled trial	This paper describes developing a mobile game-based VR program and its use for patients who have experienced a stroke and suffer from upper limb dysfunction	Korea	1. To improve strength, endurance, range of movement, control, speed, and accuracy of movement in the upper extremities	The findings from the study show that the mobile game-based VR program effectively promotes upper extremity recovery in patients with stroke. In addition, patients completed two weeks of treatment using the program without adverse effects and were generally satisfied with the program.
Hsieh et al., 2018[34]	24	Randomized controlled trial	To investigate the treatment effects of a home-based rehabilitation program compared with clinic-based rehabilitation in patients with stroke.	Taiwan	1. Fugl-Meyer Assessment 2. Motor Activity Log (MAL)	Home-based rehabilitation resulted in significantly more significant. Improvements in the Motor Activity Log include using the subscale (PZ.01) and the sit-to-stand test (PZ.03) compared to clinic-based rehabilitation. The clinic-based rehabilitation group had better benefits on the health index measured by the EuroQoL-5D Questionnaire (PZ.02) than the home-based rehabilitation group. Differences between the two groups regarding the other outcomes were not statistically significant.
Day et al., 2021[35]	48	Randomized controlled trial	To evaluate the effect of home-care nursing intervention on the burden of family caregivers for older adults surviving a stroke.	Brazil	**Caregiver's Burden Scale**	The Caregiver Burden Scale was applied to assess the outcome of the burden one week, 60 days, and one year after hospital

Table 2. Continued.

Author (year)	Study size	Study design	Country of study	Objectives/Research question	Outcome	Key Findings
						discharge. The caregivers of the intervention and CGs had no difference regarding baseline data. There was an interaction effect between the CG and the IG in the isolation domain (p = 0.037) and in the emotional involvement domain (p = 0.003) over time.
Feng et al., 2021 [36]	120	Randomized trial	China	The purpose of this study is to explore the effect of HCISM in-home rehabilitation of stroke disabled older adult.	Self-care ability Compliance behavior General Self-Efficacy Scale	The modified Barthel Index (MBI) score of the observation group after three months of intervention was higher than that of the control group (p < 0.05). In the observation group, the changes in the proportion of medication, reasonable diet, moderate exercise, and regular return visits after three months were higher than those in the control group (p < 0.05). The General Self-Efficacy Scale (GSES) score of the observation group was higher than that of the control group after three months of intervention (p < 0.05). Zung's Self-rating Anxiety Scale (SAS) and Self-rating Depression Scale (SDS) scores in the observation group were low after three months of intervention than those in the control group (p < 0.05)
Mei et al., 2018 [37]	75 couples	Randomized controlled trial	China	To evaluate the effectiveness of a modified 8-week reminiscence therapy on the burden, positive experience, and life satisfaction of older spouse caregivers and the	1. Barthel Index 2. Caregiver's Burden Scale 3. Positive Aspects of Caregiver (PAC) questionnaire The 4.5-item Chinese version of the	The use of a modified 8-week reminiscence therapy in this study sample improved the life satisfaction of stroke survivors and their spouse caregivers, improved caregivers' positive

Table 2. Continued.

Author (year)	Study size	Study design	Country of study	Objectives/Research question	Outcome	Key Findings
				life satisfaction of stroke survivors.	Satisfaction with Life Scale (SWLS)	experience, and decreased caregivers' burden.
Nordin et al., 2019[38]	90	Randomized controlled trial	Malaysia	To assess the effectiveness of a home-based carer-assisted in comparison to hospital-based therapist-delivered therapy for community-dwelling stroke survivors.	Mobility level, balance, lower limb strength and gait speed. **Secondary outcome** EQ5D-Health utility and EQ-Visual analogue Scale.	The home-based carer-assisted therapy is as effective as the hospital-based therapist-delivered training in improving post-stroke functions and quality of life.
Chen et al., 2016[39]	341	Quasi-experimental study	China	To evaluate the effectiveness of a modified home care model in China.	The following outcomes were measured and compared between the two groups: average length of hospital stay, satisfaction with acute hospitalization, ability to perform ADL; and rates of stroke recurrence, self-reported medication compliance, aspiration pneumonia, and stroke-related readmission.	Modified home care was associated with shorter acute hospitalization, higher compliance and ability to perform daily activities and a lower re-hospitalization rate.

Table 3. Showing commonalities and disparities among selected studies of intermediate home-based care.

Randomized controlled trial

S/N	Author/year	Intervention	Provider	Effect/Impact
1	Mei et al., 2017[37]	Home-based care modified reminiscence therapy (MRT)	Psychologist	• The 8-week MRT intervention for stroke couples produced a better outcome in caregivers' positive experience, life satisfaction, and life satisfaction of stroke survivors. • There was a significant reduction in the burden for caregivers who received the MRT compared to those who did not.
2	Choi and Paik, 2018[33]	Game-based therapy	Occupational therapist	• Upper limb function recovery improved significantly in the intervention group compared to conventional therapy. • Gained improvements were fully maintained at a one-month follow-up. • Improvement in the Fugl-Meyer Assessment of the upper extremity FMAUE, B-stage, and manual muscle testing were more significant with game-based therapy treatment than with conventional therapy
3	Olaleye et al., 2014[32]	Domiciliary Group (DG) (Home-based care) received physiotherapy twice weekly for ten consecutive weeks using a physiotherapy protocol	Physiotherapist	• DG showed a statistically significant increase in the postural balance scores. • DG and Control group demonstrated a significant increase in walking speed level of community reintegration from baseline to week 10 • However, the two groups were similar at any point in time throughout the assessment.
4	Nordin et al., 2019[38]	home-based therapy	Home caregiver	• Intervention and control groups demonstrated small but significant gains in all outcomes, such as functional mobility, balance ability, functional lower limb strength and walking speed, and health-related quality of life on completing 12-week interventions. • However, no significant difference was found between the groups.

Table 3. Continued.

Randomized controlled trial

S/N	Author/year	Intervention	Provider	Effect/Impact
5	Arya et al., 2012[31]	Meaning Task-Specific Training (MTST)	Physiotherapist	• The beneficial effect of (MTST) on motor recovery began in the post-treatment phase and continued during the 8-week follow-up evaluation. • There was an improvement in the sensorimotor recovery, functional use of the paretic upper extremity, and independence level of participants.
6	Hseih et al., 2018[34]	Home-based rehabilitation Treatment: Mirror therapy and task-specific training	Physiotherapist	• Patients in the home-based group indicated higher improvements in the Amount of Use (AOU) of their paretic upper extremity in daily tasks measured by the Motor Activity Log-Amount of Use (MAL-AOU) and lower extremity force measured by the sit-to-stand test than the facility-based group. • The facility-based group demonstrated increased gains in the health status measured by the EQ Index compared to the home-based group. • There was no statistically significant difference in the outcome of both groups.
7	Chaiyawat and Kulkantrakorn, 2012[30]	Home-based individual exercise program	Physiotherapist	• After two years, a 6-month home rehabilitation intervention yielded increased gains and higher levels of functional independence and ability than did the conventional care
8	Feng et al., 2021[36]	Home-based care: Hospital Community-Integrated Service Model	Multidisciplinary: Team approach which involved neurologists, rehabilitation therapists, head nurses, specialist nurses, community doctors, and nursing staff	• The modified Barthel Index (MBI) score and General Self-efficacy Scale (GSES) score of the observation group after three months of intervention was higher than that of the control group (p < 0.05) • In the intervention group, the changes in the proportion of medication, reasonable diet, moderate exercise, and regular return visits after three months

(continued)

Table 3. Continued.

Randomized controlled trial

S/N	Author/year	Intervention	Provider	Effect/Impact
9	Day et al., 2021[35]	Home-based care for guidance on disease and care activities for older adult stroke patients	Nurse	were higher than those in the control group ($p < 0.05$). • There was no difference between the intervention and control groups in the follow-up period regarding total burden, which increased in both groups, with the control group having a higher burden. • An interaction effect was found between the intervention group and control group in the isolation domain ($p = 0.037$) and the emotional involvement domain ($p = 0.003$) over time

Non-experimental longitudinal study

S/N	Author/year	Intervention	Provider	Effect/Impact
10	Scheffler and Mash et al., 2019[29]	Home and Community-Based Care (HCBC) service	Community Health Workers	• Results from the study revealed improved function but, overall, poor patient and caregiver outcomes and low satisfaction rates.

Quasi-Experimental study

S/N	Author/year	Intervention	Provider	Effect/Impact
11	Chen et al., 2016[39]	The intervention group received home-based care based on the healthcare services model and translational care model.	Multidisciplinary team: chief physician, clinical pharmacist, psychologist, specialist dietician, rehabilitation therapist, specialist nurse and community nurse	• Outcomes were significantly better in the intervention group than in the control group. • Hom-based care was associated with shorter acute hospitalization, higher compliance, ability to perform daily activities, and a lower admission rate.

respectively) at post- and follow- up assessments. The Graded Wolf Motor Function Test (GWMFT) time significantly decreased ($F(1100) = 21.72$, $p < 0.001$) at post- and follow-up assessments, Action Research Arm Test (ARAT) scores, including its subitems (grasp, grip, pinch, and gross movements) significantly changed ($F(1, 100) = 24.47$, $p < 0.001$ from pre-test to post-test. Hseih and colleagues[34] combined mirror therapy with task-specific training. The intervention included a crossover period between the home-based and facility-based rehabilitation groups. Consistent with the report by Arya et al.,[31] participants in the initial home-based group showed better improvements in the Motor Activity Log ($p = 0.01$) and sit-to-stand test ($p = 0.03$). However, the initial facility-based participants reported superior improvements in health status as measured by the EuroQol—5D (EQ-% =5D) compared to the home-based group ($p = 0.02$). The

groups had no statistically significant difference in other outcomes ($p = 0.21–0.86$). Furthermore, physiotherapist-led home-based care conducted by Chaiyawat and Kulkantrakorn[30] observed greater gains in functional outcomes such as the Barthel Index (BI), Modified Rankin Scale (mRS), and utility index in participants recruited to the home-based rehabilitation group, with statistical significance of $p < 0.001$, $p = 0.02$, and $p = 0.03$, respectively. Additionally, Choi et al.[33] employed a mobile game VR upper extremity rehabilitation program (MoU Rehab) to achieve functional recovery in older adult stroke patients. The MOU Rehab utilized the improved Fugl-Meyer Assessment of the upper extremity (FMA-UE) and manual muscle testing in the intervention arm. However, there was no statistically significant difference between the groups concerning the FMA-UE ($p = 0.735$).

However, other studies have reported divergent findings. Olaleye et al.[32] and Nordin et al.[38] employed physical therapy for the functional recovery of participants, utilizing trained physiotherapists and home caregivers, respectively, for intervention delivery. The intervention group received home-based rehabilitation, whereas the comparator group underwent facility-based therapy. Nordin et al.[38] reported significant improvements in all functional measures in both therapy groups: mobility ($p < 0.01$), balance ($p < 0.01$), lower limb strength ($p < 0.01$), and gait speed ($p < 0.05$). Olaleye et al. also reported statistically significant differences in outcomes within the two therapy groups: motor function score ($p = 0.01$), postural balance score ($p = 0.01$), and walking speed ($p = 0.01$). However, the two studies found no significant differences in outcomes between the intervention and control groups, suggesting the likelihood of similar outcomes for home-based and facility-based rehabilitation.

In a randomized controlled trial, Feng et al.[36] specifically employed a multidisciplinary approach to deliver the Hospital Community-Integrated Services Model (HCISM) to older adult stroke patients recruited in the intervention group for home-based care. The implementation of the model began from patient admission to discharge to a community health facility and eventual home discharge. The uniqueness of this model lies in the incorporation of personalized care for older adult stroke patients with intervention plans tailored to specific patient needs. The control group received routine home-based rehabilitation knowledge, training guidance, and encouragement to ensure medication compliance. Outcome measures were assessed three months after the intervention. The results revealed an improved Modified Barthel Index (MBI) score ($p < 0.05$) and General Self-Efficacy Scale (GSES) score ($p < 0.05$) in the intervention group compared with the control group. Zung's Self-rating Anxiety Scale (SAS) and Self-rating Depression Scale (SDS) scores were significantly lower in the intervention group than in the control group ($p < 0.05$).

Mei et al.[37] conducted a randomized controlled trial using a psychologist-led modified reminiscence therapy (MRT) intervention for eight weeks. Participants were categorized into three groups. Group 1 consisted of couples that underwent MRT. Group 2 included only spouses who received MRT, and Group 3 (control) received routine health education. Overall, the participants in Group 1 experienced a significant improvement in caregivers' positive experiences, life satisfaction, burden, and life satisfaction of stroke survivors ($p < 0.001$). In a study by Day et al.,[35] the intervention group received three home visits within a month post-discharge by nurses to provide guidance on disease and care activities for older adult individuals. The control group relies on a service network for access. The study reported no significant difference between the intervention and control groups in terms of total burden at the one-year follow-up period ($p = 0.708$). However, there was an interaction effect between the control group and the intervention in the isolation ($p = 0.037$) and emotional involvement domains ($p = 0.003$).

A longitudinal study conducted by Scheffler et al.,[29] applied home- and community-based interventions (HCBC) provided by community health workers (CHWs). Despite improving functional outcomes ($p = 0.019$) from 40.0 (IQR = 15.0–70.0) to 62.5 (IQR = 30.0–81.25), a high level of dependence persisted, and low satisfaction rates were recorded for both patients and caregivers in all aspects. Poor patient outcomes were linked to inactive engagement of CHWs in assisting patients with stroke to achieve functional goals.

Chen et al.[39] conducted a quasi-experimental study using a multidisciplinary approach to deliver home-based care. The intervention group significantly outperformed the control group in this regard. Study outcomes indicated that the intervention group showed a shorter average length of hospitalization (11.29 ± 2.18 versus 12.36 ± 4.33 d, $p = 0.03$), increased ability to perform rates of daily living (38.25 ± 10.22 versus 32.08 ± 10.32, $p = 0.03$), increased rates of readmission [2 (1.19%) versus 11 (6.36%), $p = 0.02$], improved medication compliance [161 (95.83%) versus 92 (53.18%), $p = 0.004$] and a higher rate of satisfaction with acute hospitalization [168 (100.00%) versus 142 (82.08%), $p = 0.01$]. Chen et al.[39] and Feng et al.[36] employed different designs. However, the similarity in their results suggests that considering a multidisciplinary approach has great potential for significantly improving patient functional outcomes and quality of life.

Nordin et al.[38] and Chaiyawat and Kulkantrakorn[30] reported improved health-related quality of life in stroke survivors of their study. Using the utility index, Chaiyawat and Kulkantrakorn[30] reported a significant increase in quality of life scores in the two study groups, with a significantly higher improvement in the intervention group (intervention group 0.9 ± 0.02 and control group 0.7 ± 0.04, $p = 0.03$). Nordin et al.[38] measured quality of life using the EQ5D Health utility score. Although both groups showed a significant improvement in the quality of life score ($p < 0.05$), there was no statistically significant difference between the groups.

Existing gaps in the intermediate home-based care

The gaps identified in the selected studies may be linked to various factors. However, most of the gaps highlighted were due to methodological limitations. In one study, Scheffler and Mash[29] reported the possibility of recall bias if proper measures were not taken in the data collection procedure. The same study recognized probable variations in data quality due to the high number of research assistants used. The inclusion of only ischemic stroke with middle cerebral artery infarction in the Chaiyawat and

Kulkantrakorn[30] study limited the applicability of the findings to populations with other types of stroke. Conducting research that includes different types of stroke will establish possible benefits for this population. In two of the reviewed studies, Mei et al.[37] and Choi and Paik et al.[33] reported using a small sample size. This undermines the internal and external validity of studies and limits their generalizability. In the study by Hseih et al.,[34] the treatment and duration frequency for home-based stroke rehabilitation were designed based on the authors' discretion. The justification stated was the absence of an established treatment and frequency of home-based stroke rehabilitation. Another area for improvement is the inability to estimate the cost of home-based care. This should be considered in future studies to establish a standard home-based therapy in this context. In addition to methodological limitations, confounders may affect outcomes if not adjusted. Day et al.[35] documented that caregivers received assistance from the facility, which might influence patient and caregiver outcomes. Similarly, Olaleye et al.[32] reported that study participants could receive other forms of treatment together with the intervention, which could have an impact on the recorded outcomes. Additionally, implementing individualized care could have been more achievable due to the inability to obtain the necessary baseline data to inform the design of such therapies. For instance, Choi et al.[33] acknowledged missing kinematic data that could assist in optimizing individualized rehabilitation therapies. These gaps and limitations underscore further research's need to address these issues and enhance our understanding of the effectiveness of intermediate home-based care for stroke patients.

Discussion

Our findings showed varying outcomes regarding the effectiveness of home-based intermediate care in stroke survivors. Some studies showed discordant results, while others showed effects in physical therapy, occupational therapy, speech therapy, and meaningful task-specific training for patients.[30,31] Notably, task-specific training was superior to impairment-focused training, leading to improved motor recovery and functional use of the affected upper extremity when conducted over an extended period.[31] Consistent with these findings, other studies have robustly supported the efficacy of task-related motor training in enhancing gait and gait-related activities post-stroke.[40,41] Bilateral training procedures, such as meaningful task-specific training (MTST), have shown particular benefits for tasks involving the activation of proximal muscles, highlighting the role of bilateral descending pathways in the proximal musculature.[42] In patients with subacute stroke, MTST has been associated with enhanced motor recovery, reduced activity limitation, improved time and quality of movement, and increased use of the paretic arm and hand during activities of daily living (ADL). It should

be noted that these findings were obtained in an intermediate home/community care setting.

Furthermore, a systematic review comparing home-based and center-based rehabilitation for stroke patients in communities emphasized the functional advantage of home-based care, suggesting that individuals adapt better to residual impairments when receiving home therapy.[43,44] Stroke-related impairments are more apparent in patients' homes and everyday circumstances, making it easier to tailor rehabilitation programs to individual needs. It is noticeable in patients' homes or everyday circumstances, making customizing rehabilitation programs according to their requirements more straightforward. Patients can better develop adaptation strategies to compensate for apparent impairments at home than in other environments. Olaleye et al.[32] reported a statistically significant improvement in postural balance over ten weeks, highlighting the effectiveness of balance training related to specific tasks.[45] Stroke survivors training their balance using the Berg Balance Scale domains have been associated with improved community reintegration,[46,47] emphasizing the importance of balance function in post-stroke social integration. This study emphasizes the critical connection between improved motor function and community reintegration, as functional status significantly influences social integration post-stroke.[48]

Strengths and limitations of this study

This systematic review provides important information on the effects of home-based care on motor recovery, quality of movement, motor acquisition, walking speed and postural balance. Our study exhibited thoroughness regarding study selection, screening processes, search strategy, and quality assessment. We employed standardized methods for these processes to minimize bias. Despite the strengths, notable limitations exist. The primary limitation is the single-reviewer approach for title, abstract, and full-text screening. Additionally, the wide range of interventions and outcomes used in the reviewed articles posed challenges in evaluating the impact and effectiveness of the interventions. The objective of this review focuses on stroke, however, future studies should investigate the baseline cognitive status of older stroke patients which may act as a confounder to participants' functional dependence and the effectiveness of the intervention provided.

Despite these limitations, our review successfully identified gaps due to different methodologies and inconsistent results in the existing model of home-based care and potentially affecting the synthesis of results and the overall robustness of the conclusions drawn from the study This highlights the crucial role of intervention and rehabilitation programs in improving the functional health of individuals living with stroke. Subsequently, study results could assist in guiding policy and practice.

Conclusion

In conclusion, this study provides significant data supporting the effectiveness of the existing intermediate home-based care model, emphasizing the positive impacts on motor recovery, quality of movement, motor acquisition, walking speed, and postural balance. The identified home-based intermediate care options for older adult stroke patients include physical therapy, occupational therapy, speech therapy, and meaningful task-specific training. This study highlights the positive functional outcomes of these interventions, the inconsistency in results, and existing gaps in the current home-based care model due to varying methodologies. These findings emphasize the importance of continued research to refine and optimize interventions for individuals living with stroke, thereby enhancing their overall functional health.

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Statements and declarations

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Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data availability

All data relevant to the study are included in the article or are uploaded as supplementary information.

Supplemental material

Supplemental material for this article is available online.

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