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Nurse-led and nurse-coordinated exercise rehabilitation for functional recovery in post-stroke patients: a systematic literature review

Dally Rahman¹, Jeki Haryanto^{*2}

¹Universitas Andalas

² Universitas Negeri Padang

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ABSTRACT

Stroke is a leading cause of acquired adult disability, and most survivors retain motor, functional, and psychosocial impairments that constrain independence and quality of life. Although exercise-based rehabilitation is central to recovery, the specific contribution of nursing care to delivering, coordinating, and sustaining exercise rehabilitation remains fragmented across the literature. This systematic literature review synthesized evidence on exercise rehabilitation delivered within post-stroke nursing care and its effectiveness for functional recovery. The review followed the PRISMA 2020 framework, searching the Scopus database for peer-reviewed English-language journal articles published between 2016 and 2025. Of 155 records identified, 15 duplicates were removed, 140 records were screened, 31 full-text reports were assessed, and 13 studies met the eligibility criteria. Included studies comprised randomized and non-randomized controlled trials, a cluster-trial process evaluation, a Delphi consensus study, and case reports, conducted predominantly in Asia. Nurse-delivered, nurse-guided, and nurse-coordinated exercise interventions were consistently associated with improved activities of daily living, motor function, balance, mobility, and quality of life, and were non-inferior to therapist-led rehabilitation. Findings support integrating structured exercise rehabilitation into nursing care while highlighting the need for adequately powered, standardized trials. Future research should establish optimal dose, delivery models, and long-term outcomes.



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Corresponding Author:

Jeki Haryanto,
Universitas Negeri Padang
Email: jekiharyanto@fik.unp.ac.id

Introduction

Stroke remains one of the leading causes of long-term adult disability worldwide and imposes a substantial and escalating burden on health systems, families, and survivors (Hewitt et al., 2016). The consequences of stroke extend well beyond the acute event: a large proportion of survivors live with enduring motor, sensory, cognitive, and psychosocial sequelae that erode independence and diminish quality of life (An & Shaughnessy, 2011; Chen & Rimmer, 2011). Because the disabling effects of stroke are frequently chronic, recovery is best understood as a prolonged trajectory that spans acute care, inpatient rehabilitation, transition to the community, and long-term self-management (Crocker et al., 2013; Graven et al., 2011). Within this trajectory, exercise-based rehabilitation has become a cornerstone of recovery, with accumulating evidence that structured physical activity can improve balance, gait, cardiorespiratory fitness, and functional independence (An & Shaughnessy, 2011; Boyne et al.,

2017; Machado et al., 2022). Understanding how such rehabilitation can be delivered effectively, and by whom, is therefore a question of considerable clinical and public-health significance.

The central phenomenon addressed in this review is the delivery of exercise rehabilitation within nursing care for people recovering from stroke. Motor impairment, particularly hemiplegia and lower-limb dysfunction, is among the most common and persistent problems after stroke, and it directly compromises mobility, activities of daily living, and social participation (An & Shaughnessy, 2011; Howlett et al., 2015). A wide range of exercise modalities has been developed to address these impairments, including task-specific training, aerobic and resistance exercise, and gait-oriented interventions (Boyne et al., 2017; Gamble et al., 2021). Yet the effectiveness of any modality depends not only on its physiological rationale but also on how consistently it is delivered, supervised, and reinforced across care settings (Graven et al., 2011; Mehrholz et al., 2020). Nurses, who provide continuous contact with patients across the care continuum, are uniquely positioned to embed exercise rehabilitation into routine care, making the intersection of exercise and nursing an important and underexamined focus.

A substantial body of research has examined exercise-based rehabilitation after stroke. Systematic reviews and meta-analyses report benefits of exercise for quality of life, balance and gait, and cardiorespiratory fitness (An & Shaughnessy, 2011; Chen & Rimmer, 2011; Machado et al., 2022), while trials of specific approaches—such as electromechanical-assisted and robot-assisted gait training, functional electrical stimulation, and traditional movement practices—have demonstrated improvements in walking and limb function (Ge et al., 2017; Howlett et al., 2015; Mehrholz et al., 2020; Taki et al., 2022). Adjunctive and alternative strategies, including walking training with poles, core-stability exercise, and Pilates-based programs, have broadened the rehabilitation toolkit (Gamble et al., 2021; Ono et al., 2023; Stivala & Hartley, 2014). Scoping reviews of gait and balance rehabilitation further indicate a rapidly diversifying evidence base (Saraiva et al., 2023; Teodoro et al., 2024). Collectively, this literature establishes that exercise is effective, but it is dominated by therapist-delivered interventions and often overlooks the organizational and human-resource contexts in which rehabilitation is actually sustained.

Recent trends have shifted attention toward extending rehabilitation beyond the clinic and toward more scalable delivery models. Home-based and technology-enabled approaches—including telesurveillance, telerehabilitation, and caregiver-mediated exercise supported by e-health platforms—have emerged as promising means of maintaining exercise engagement after discharge (Bernocchi et al., 2016; Vloothuis et al., 2015; Vloothuis et al., 2016; Wu et al., 2020). These models respond to a well-documented service gap in which resources are concentrated in inpatient settings while community and home-based rehabilitation remain comparatively neglected (Crocker et al., 2013; Graven et al., 2011). At the same time, growing recognition of post-stroke mood disturbance and its impact on rehabilitation participation has prompted interest in interventions that combine exercise with psychosocial support (Balram et al., 2025; Jun et al., 2013; van Nimwegen et al., 2023). Such developments increasingly implicate nursing roles, because sustaining exercise in the home and integrating physical and psychosocial care are functions well aligned with nursing practice.

Despite this progress, the specific contribution of nursing care to exercise rehabilitation after stroke remains underexplored and fragmented. Although nurses frequently supervise mobilization, coordinate multidisciplinary rehabilitation, and educate patients and families, the evidence describing nurse-led or nurse-guided exercise interventions is dispersed across heterogeneous designs and outcomes (De Man-Van Ginkel et al., 2010; Mi et al., 2024). Guidance oriented specifically to nurses—for example, on incorporating structured movement practices such as Tai Chi—exists but is limited (Miller et al., 2020), and studies linking nurse-delivered exercise to functional recovery are comparatively scarce (Shaughnessy et al., 2012). Consequently, the field lacks a consolidated understanding of what exercise rehabilitation delivered within nursing care actually comprises, and how its effects compare with conventional therapist-led approaches. This first gap concerns the scope and characterization of nurse-associated exercise interventions.

A second gap is theoretical and methodological. The available literature is characterized by heterogeneous intervention definitions, inconsistent outcome measurement, and variable methodological rigor, which together hinder synthesis and limit the strength of practice recommendations (Gwynne-Mayer et al., 2025; van Nimwegen et al., 2023). Adherence to exercise rehabilitation is a persistent challenge, yet the mechanisms and support structures that sustain participation—many of which fall within the nursing remit—are seldom examined systematically (Gwynne-Mayer et al., 2025). Furthermore, few studies situate nurse-delivered exercise within explicit theoretical frameworks or evaluate it against comparators using standardized, functionally meaningful endpoints (De Man-Van Ginkel et al., 2010; Mi et al., 2024). These limitations make it difficult to determine whether nursing-embedded exercise rehabilitation confers benefits comparable to established models, and under what conditions. A systematic appraisal that maps interventions, designs, and outcomes is therefore warranted.

Addressing these gaps is timely and necessary. As stroke incidence and survivorship rise, and as health systems seek sustainable, workforce-efficient rehabilitation models, clarifying the role of nursing in exercise rehabilitation has direct implications for service design and patient outcomes (Graven et al., 2011; Hewitt et al., 2016). A synthesis that consolidates the evidence, characterizes the interventions, and evaluates their effectiveness can inform both practice and future trials. Accordingly, this systematic literature review synthesizes peer-reviewed evidence on exercise rehabilitation delivered within post-stroke nursing care. Guided by the PRISMA 2020 framework (Page et al., 2021), the review pursues two research questions.

RQ1: What types of exercise rehabilitation interventions delivered within post-stroke nursing care are effective in improving patients' functional recovery?

RQ2: How effective are exercise rehabilitation interventions, compared with usual care or other interventions, in improving mobility, balance, activities of daily living, and quality of life among post-stroke patients?

Method

Research Design and Framework

This study adopted a systematic literature review (SLR) design to identify, appraise, and synthesize existing evidence in a transparent and reproducible manner (Liberati et al., 2009; Tranfield et al., 2003). The SLR approach was selected because the research questions require an integrative, critical synthesis of a heterogeneous body of primary studies rather than the generation of new empirical data. The review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement, which provides an updated, structured framework for the identification, screening, eligibility assessment, and inclusion of studies (Page et al., 2021). Adherence to PRISMA 2020 enhances methodological transparency and allows readers to trace each decision from the initial search to the final synthesis.

Search Strategy

Prior to constructing the search string, the research questions were decomposed using the PICOS framework (Population, Intervention, Comparison, Outcome, Study design) to ensure systematic identification of the key search concepts. The Population comprised patients with stroke, post-stroke conditions, or cerebrovascular accident. The Intervention of interest was exercise rehabilitation, including exercise therapy, therapeutic exercise, physical exercise, rehabilitation exercise, and physical training delivered within, or in conjunction with, nursing care. The Comparison, where present, was usual care, conventional rehabilitation, or an alternative intervention; comparators were assessed during screening and were not embedded as a mandatory string element. The Outcomes of interest were functional recovery outcomes such as mobility, balance, activities of daily living, and quality of life, which were evaluated during screening. The Study design was restricted to journal articles.

Each PICOS element was translated into a cluster of keywords and synonyms, which were then combined into a Boolean search string. The exact string executed in Scopus was:

((stroke OR "post-stroke" OR "cerebrovascular accident") AND ("exercise rehabilitation" OR "exercise therapy" OR "physical exercise" OR "rehabilitation exercise" OR "therapeutic exercise" OR "physical training") AND (nurs* OR "nursing care" OR "nursing intervention*" OR "rehabilitation nursing"))

Truncation and wildcard operators were used to capture morphological variants; for example, the term *nurs** retrieved *nurse*, *nurses*, *nursing*, and related forms, and *nursing intervention** retrieved singular and plural forms. The search was applied to the TITLE-ABS-KEY field code in Scopus, restricting retrieval to the title, abstract, and author keywords of each record. Limiters were applied for document type (article), language (English), source type (journal), and publication period (2016–2025). The search string was piloted and refined iteratively: preliminary strings that omitted the nursing concept returned an unmanageable volume of purely therapist-led rehabilitation records, so the nursing cluster was retained as a mandatory component to align the retrieved set with the review focus. The PICOS framework here served solely to structure the search strategy and is distinct from the quality appraisal procedure described below.

Database and Information Sources

Scopus was used as the primary and authoritative bibliographic database, given its broad, multidisciplinary coverage of peer-reviewed health, nursing, and rehabilitation literature and its structured metadata, which support reproducible retrieval and export. The search was executed on 10 September 2025, covering publications from 1 January 2016 to 31 December 2025. The search was executed on a single date, and all identified records

were exported for screening. No supplementary databases were used; this decision is acknowledged as a limitation of the review.

Eligibility Criteria

Records were assessed against predefined inclusion and exclusion criteria (Table 1). Studies were included if they were peer-reviewed journal articles, published in English between 2016 and 2025, that examined exercise rehabilitation delivered within or in conjunction with nursing care for stroke populations and reported relevant functional, mobility, or quality-of-life outcomes. Studies were excluded if they addressed non-stroke populations, did not involve exercise-based rehabilitation, were reviews or study protocols, or reported only descriptive profiles or measurement development without a rehabilitation intervention.

Table 1. Inclusion and exclusion criteria

Criterion	Inclusion	Exclusion
Language	English	Non-English
Document type	Journal article	Review, conference paper, book chapter, editorial, study protocol
Publication period	2016–2025	Before 2016
Population	Stroke / post-stroke / cerebrovascular accident	Non-stroke populations (e.g., diabetes, heart failure, orthopedic)
Intervention	Exercise rehabilitation within or alongside nursing care	No exercise-based rehabilitation component
Outcomes	Functional recovery, mobility, balance, ADL, quality of life	Outcomes unrelated to functional recovery; measurement/profile only
Source type	Peer-reviewed journal	Non-journal sources
Accessibility	Full text available	Abstract only / inaccessible

Study Selection Process

Study selection followed a multi-stage process consistent with PRISMA 2020. After removing duplicate records, titles and abstracts were screened against the eligibility criteria to exclude clearly irrelevant records. Reports judged potentially eligible were retrieved in full text and assessed in detail. At each stage, reasons for exclusion were documented, and uncertainties were resolved through discussion to reach consensus. The complete flow of records, with counts at each stage, is presented in the PRISMA 2020 flow diagram (Figure 1). Screening and eligibility assessment were conducted independently by two reviewers at both the title-and-abstract and full-text stages. Inter-rater agreement was calculated using Cohen's kappa (Cohen, 1960) and yielded $\kappa = 0.83$ for title-and-abstract screening and $\kappa = 0.86$ for full-text eligibility assessment, both indicating strong concordance by the Landis and Koch (1977) classification. All disagreements were resolved through discussion; where consensus could not be reached, a third reviewer provided a final decision.

Quality Assessment

Quality assessment was conducted independently of the PICOS-based search strategy using design-specific critical appraisal tools. Each included study was evaluated with the appraisal instrument most appropriate for its research design rather than applying a single tool across all study designs. The assessment followed four steps: classifying each study by its reported design, selecting the appropriate appraisal tool, evaluating all criteria using the original response categories (e.g., yes, no, and unclear), and incorporating methodological strengths and limitations into the synthesis.

Randomized controlled trials were assessed using the Cochrane Risk of Bias 2 (RoB 2) tool, non-randomized and quasi-experimental studies using the JBI Quasi-Experimental Checklist, case reports using the JBI Case Report Checklist, and the Delphi consensus study through narrative appraisal because no standard risk-of-bias tool is available for this design. Methodological quality was considered qualitatively during the synthesis rather than using numerical scores as exclusion thresholds, in line with recommendations from appraisal-tool developers. Quality appraisal was conducted independently by two reviewers. Inter-rater agreement for appraisal decisions yielded $\kappa = 0.81$, indicating strong agreement (Landis & Koch, 1977). Disagreements on individual checklist items were resolved by discussion and, where necessary, a third reviewer's decision. A summary of the quality appraisal is presented in Table 2.

Table 2. Methodological quality assessment of included studies

Author(s), Year	Study Design	Appraisal Tool	Overall
Zhang et al., 2024	RCT	Cochrane RoB 2	Moderate

Author(s), Year	Study Design	Appraisal Tool	Overall
Lv & Chen, 2022	Non-randomized experimental	JBI Quasi-Experimental Checklist	Low–moderate
Yingying et al., 2022	Quasi-randomized controlled trial	JBI Quasi-Experimental Checklist	Moderate
Mao et al., 2025	RCT	Cochrane RoB 2	Moderate–high
Putra et al., 2024	Consensus (Delphi)	Narrative appraisal (no design-specific RoB tool)	Moderate
Li et al., 2021	RCT	Cochrane RoB 2	Moderate
Salbach et al., 2017	Cluster RCT (process evaluation)	Cochrane RoB 2 (cluster-adapted)	High
Chen et al., 2021	RCT	Cochrane RoB 2	High
Hermawan & Wihardja, 2021	Case report	JBI Case Report Checklist	Low
Nagai & Yamaguchi, 2017	Case report	JBI Case Report Checklist	Low
Yuet Wong et al., 2022	RCT	Cochrane RoB 2	High
Wang et al., 2021	RCT (non-inferiority)	Cochrane RoB 2	High
Nadeem et al., 2024	RCT	Cochrane RoB 2	Moderate

Data Extraction

A structured data-extraction form was used to capture, from each included study, the author(s) and year, country, study design, sample characteristics, the exercise rehabilitation intervention and its delivery within nursing care, outcome measures, and key findings. Extracted data were tabulated to facilitate comparison across studies and to support the thematic synthesis.

Data Synthesis

Given the heterogeneity of designs, interventions, and outcome measures across the included studies, a narrative thematic synthesis was undertaken rather than a statistical meta-analysis (Thomas & Harden, 2008). Findings were coded and organized into themes reflecting the types of exercise rehabilitation delivered within nursing care and their reported effects on functional recovery, aligning the synthesis with the two research questions. Agreements, contradictions, and nuances across studies were examined, and methodological quality informed the weight given to each study during interpretation.

Reporting and Documentation

The review was documented in accordance with the PRISMA 2020 checklist and flow diagram to ensure transparency and reproducibility (Page et al., 2021). All counts reported in the abstract, methods, and results are numerically consistent with the flow diagram presented in Figure 1.

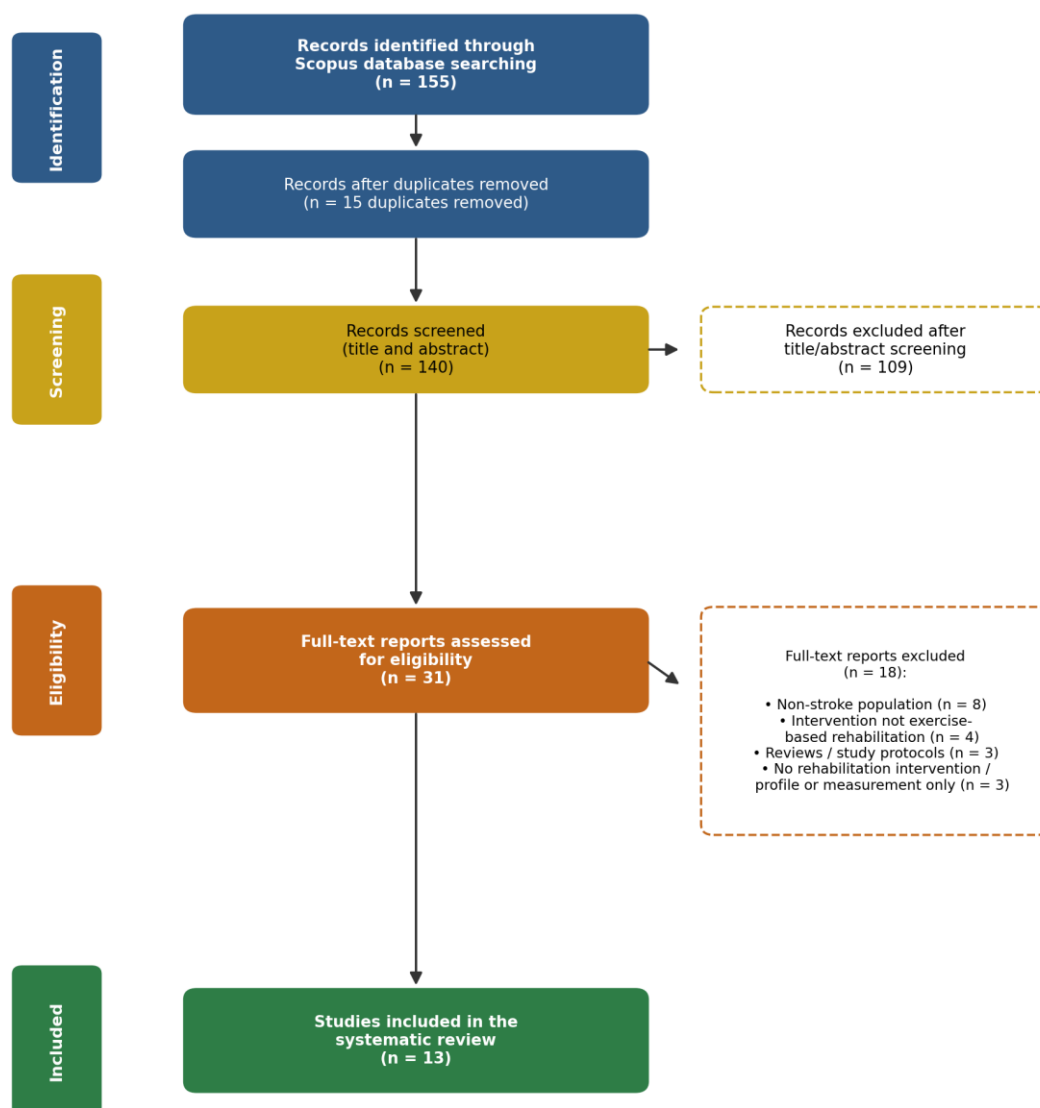


Figure 1. PRISMA 2020 flow diagram of the study selection process (adapted from Page et al., 2021).

Results and Discussions

Study Selection Results

The database search identified 155 records from Scopus. After removing 15 duplicate records, 140 records were screened by title and abstract, of which 109 were excluded as clearly irrelevant to exercise rehabilitation within post-stroke nursing care. The remaining 31 full-text reports were assessed for eligibility, and 18 were excluded: 8 involved non-stroke populations, 4 did not evaluate exercise-based rehabilitation, 3 were reviews or study protocols, and 3 reported only descriptive profiles or measurement development without a rehabilitation intervention. Thirteen studies satisfied all eligibility criteria and were included in the final synthesis. The complete selection process is depicted in Figure 1.

Descriptive Characteristics of Included Studies

The 13 included studies were published between 2017 and 2025, with the largest number appearing in 2021 (Figure 2). Screening inter-rater agreement was $\kappa = 0.83$ for title-and-abstract screening and $\kappa = 0.86$ for full-text assessment; quality appraisal agreement was $\kappa = 0.81$. Quality appraisal results (Table 2) show that 4 of 13 studies were rated High (Salbach et al., 2017; Chen et al., 2021; Yuet Wong et al., 2022; Wang et al., 2021), 6 were rated Moderate or Moderate-High (Zhang et al., 2024; Yingying et al., 2022; Mao et al., 2025; Putra et al., 2024; Li et al., 2021; Nadeem et al., 2024), 2 were rated Low-Moderate (Lv & Chen, 2022; Lv & Chen), and 2 case reports were rated Low (Hermawan & Wihardja, 2021; Nagai & Yamaguchi, 2017). The causal

conclusions of this review rest principally on the 4 High-quality studies and 6 Moderate–High studies; findings from case reports and Low-quality studies are treated as illustrative and hypothesis-generating rather than confirmatory. Geographically, the evidence base was concentrated in Asia, with the majority of studies conducted in China, followed by Indonesia, and single studies from Canada, Japan, and Pakistan; one study did not specify a country (Figure 3). The studies employed a range of designs, dominated by randomized controlled trials, and also including non-randomized controlled trials, a process evaluation of a cluster randomized trial, a modified Delphi consensus study, and two case reports. Sample sizes ranged from single-case reports to trials enrolling more than 200 participants. The full characteristics of the included studies are presented in Table 3, and their classification by theme, design, intervention, and outcome is presented in Table 4.

Table 3. Characteristics of the included studies

Title	Author(s), Year	Country	Design	Key Findings
Multidisciplinary management based on clinical nursing pathway model for the treatment of hypertensive intracerebral hemorrhage: A randomized controlled trial	Zhang et al., 2024	China	RCT	The study group showed significantly greater improvement in activities of daily living and neurological function, lower stress-response indicators, fewer complications (3.23% vs 15.00%), and higher nursing satisfaction (95.16% vs 83.33%).
Effect of Virtual Reality Combined with Intelligent Exercise Rehabilitation Machine on the Nursing Recovery of Lower Limb Motor Function of Patients with Hypertensive Stroke	Lv & Chen, 2022	China	Controlled experimental study	The intelligent exercise rehabilitation machine improved lower-limb motor function by approximately 30% relative to conventional treatment and supported rehabilitation prognosis and prevention of complications.
Effect of Continuous Care Combined with Constraint-Induced Movement Therapy Based on a Continuing Care Health Platform on MBI and FMA Scores of Acute Stroke Patients	Yingying et al., 2022	China	Controlled trial (quasi-randomized)	Group A achieved higher FMA (38.42 vs 31.22) and modified Barthel Index (78.63 vs 70.24) scores, better ADL, trunk control, self-care ability, quality of life (GQOL-74 72.13 vs 63.19), and gait parameters than routine rehabilitation exercise.
Clinical Effectiveness of Multimodal Exercise Combined with Supportive Music and Imagery in the Management of Poststroke Mood Disorders	Mao et al., 2025	China	RCT	The observation group showed significantly greater reductions in anxiety and depression (HADS) and psychological distress (K10) and greater improvement in well-being (WBIS) across the 3-, 6-, and 9-month assessments.
Development of a self-care guideline to prevent rehospitalization in stroke patients: a modified Delphi study	Putra et al., 2024	Indonesia	Modified Delphi (consensus)	Consensus was reached across three Delphi rounds on seven self-care themes including physical exercise, with 100% expert agreement (scores of 8 or above) on the final guideline.
Application Value of Rehabilitation Nursing in Patients with Stroke Based on the Theory of Interactive Standard: A Randomized Controlled Study	Li et al., 2021	China	RCT	The observation group had higher Barthel Index and SS-QOL scores, lower NIHSS scores, shorter limb-function improvement time, and greater rehabilitation-exercise compliance (83.33% vs 63.33%) and nursing satisfaction (96.67% vs 78.33%).
Facilitated interprofessional implementation of a physical rehabilitation guideline for stroke in inpatient settings: Process evaluation of a cluster randomized trial	Salbach et al., 2017	Canada	Process evaluation of a cluster RCT	Facilitated knowledge translation improved implementation of sit-to-stand and walking training, whereas passive translation improved standing-balance training; concurrent integration of all 18 recommended treatments was not achieved.
Effectiveness of a home-based exercise program among patients with lower limb spasticity post-stroke: A randomized controlled trial	Chen et al., 2021	Not specified	RCT	Significant improvements in spasticity, motor function, walking ability, and ADL were observed at 6 and 12 months after discharge, favoring the nurse-guided home-based exercise program.

Title	Author(s), Year	Country	Design	Key Findings
Pursuing the need for physical activity in recurrent cva patients during hospitalization: A case report	Hermawan & Wihardja, 2021	Indonesia	Case report	The report illustrates a nursing-theory-based approach to delivering physical rehabilitation exercise during hospitalization to address recurrence risk and disability in a recurrent-CVA patient.
Improved functional independence measure facilitates return to home after paralyzed upper-limb training: A case report	Nagai & Yamaguchi, 2017	Japan	Case report	Combined ADL training and active training of the affected upper limb improved the Functional Independence Measure score, promoted functional recovery, and facilitated the patient's return home.
Effects of a transitional home-based care program for stroke survivors in Harbin, China: a randomized controlled trial	Yuet Wong et al., 2022	China	RCT	The intervention produced significantly greater improvement in quality of life (EQ-5D-5L and EQ-VAS), stroke symptoms, self-efficacy, and ADL (modified Barthel Index) at 90 and 180 days than standard care.
Effectiveness of rehabilitation nursing versus usual therapist-led treatment in patients with acute ischemic stroke: A randomized non-inferiority trial	Wang et al., 2021	China	RCT (non-inferiority, assessment-blinded)	Rehabilitation nursing was non-inferior to therapist-led treatment on motor outcomes (MAS, FMA, ARAT) and secondary outcomes (modified Barthel Index, NIHSS, mRS), with both groups improving significantly.
Effects of core muscles strengthening exercises with routine physical therapy on trunk balance in stroke patients: A randomized controlled trial	Nadeem et al., 2024	Pakistan	RCT	Core-muscle strengthening exercises combined with routine physiotherapy produced significantly greater improvement in trunk balance (Trunk Impairment Scale) and functional mobility (Timed Up and Go) than routine physiotherapy alone.

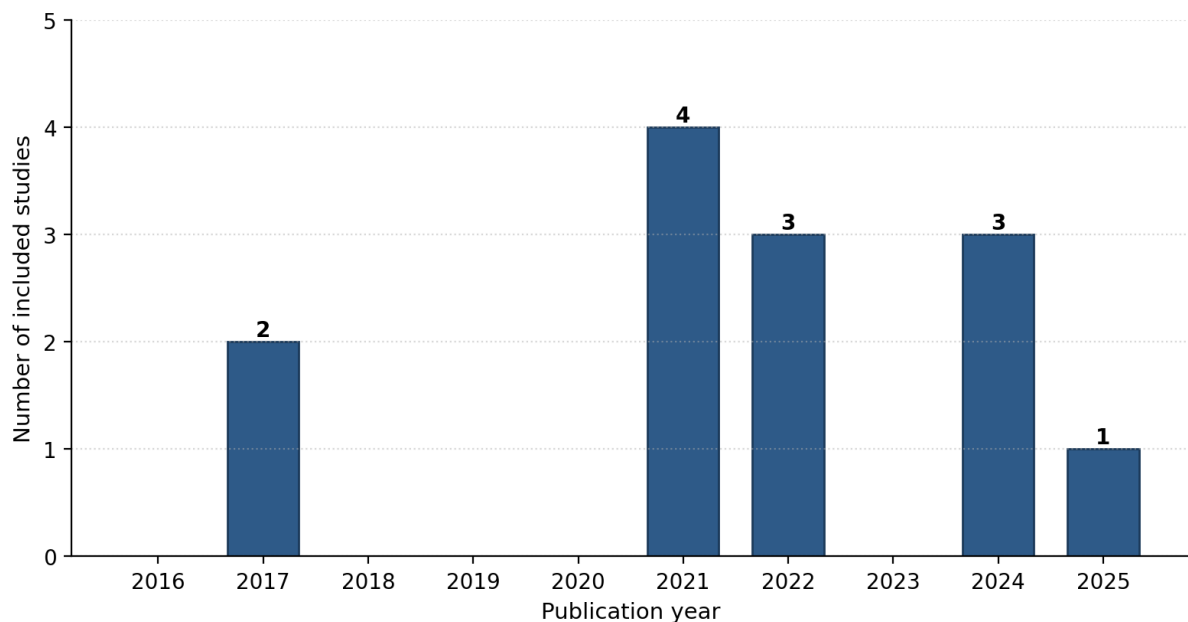


Figure 2. Annual distribution of the included studies (2016–2025).

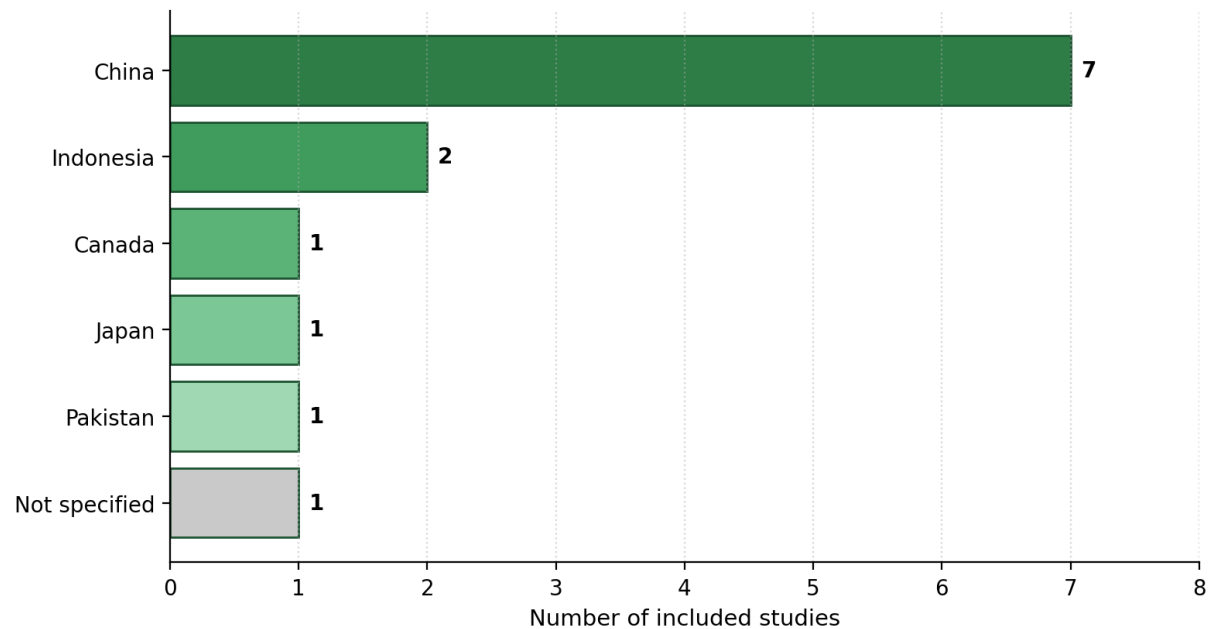


Figure 3. Geographic distribution of the included studies by country.

Table 4. Classification of included studies by theme, design, intervention, and outcome

Author(s), Year	Research Design	Theme / Intervention	Outcome Focus
Zhang et al., 2024	RCT	Nurse-coordinated multidisciplinary rehabilitation - Multidisciplinary clinical nursing pathway (physician, psychotherapist, nutritionist, rehabilitation specialist, 4 nurses) including guided rehabilitation exercises vs routine care	ADL, neurological function, complications, satisfaction
Lv & Chen, 2022	Controlled experimental study	Technology-assisted exercise rehabilitation - Virtual reality combined with an intelligent exercise rehabilitation machine vs conventional treatment	Lower-limb motor function; complication prevention
Yingying et al., 2022	Controlled trial (quasi-randomized)	Nurse-led continuous care with task-specific exercise (CIMT) - Continuous nursing combined with constraint-induced movement therapy (CIMT) via a continuing-care health platform vs routine rehabilitation exercise	Upper-limb function, ADL, trunk control, QoL, gait
Mao et al., 2025	RCT	Exercise with psychological adjunct within nursing care - Multimodal exercise (MME) plus supportive music and imagery added to conventional nursing vs conventional nursing	Anxiety/depression, psychological distress, well-being
Putra et al., 2024	Modified Delphi (consensus)	Nurse-led self-care guideline development - Development of a nurse-led self-care guideline (including physical exercise) to prevent rehospitalization	Consensus self-care guideline
Li et al., 2021	RCT	Theory-guided rehabilitation nursing - Interactive-standard-theory-based rehabilitation nursing vs routine nursing care	ADL, neurological function, QoL, adherence, satisfaction
Salbach et al., 2017	Process evaluation of a cluster RCT	Interprofessional guideline implementation (nurse-inclusive teams) - Facilitated vs passive knowledge translation of a stroke physical-rehabilitation guideline, using nurse and therapist facilitators	Treatment implementation fidelity
Chen et al., 2021	RCT	Nurse-guided home-based exercise - Advanced-practice-nurse-guided home-based rehabilitation exercise program (HREPro) vs conventional rehabilitation	Spasticity, motor function, walking ability, ADL
Hermawan & Wihardja, 2021	Case report	Nurse-delivered inpatient physical activity - Two nurse-delivered post-CVA physical rehabilitation exercise programs during hospitalization, structured by nursing theory	Physical activity and mobility (descriptive)

Author(s), Year	Research Design	Theme / Intervention	Outcome Focus
Nagai & Yamaguchi, 2017	Case report	Intensive functional and exercise rehabilitation - 170-day intensive rehabilitation combining occupational therapy and affected-side upper-limb physical training in a recovery-phase ward	FIM, ADL, discharge home
Yuet Wong et al., 2022	RCT	Nurse-led transitional home-based care with exercise - 12-week nurse-initiated home-based transitional care program with guideline-based home exercises vs standard care	QoL, symptoms, self-efficacy, ADL
Wang et al., 2021	RCT (non-inferiority, assessment-blinded)	Nurse- vs therapist-delivered rehabilitation - Nurse-delivered rehabilitation nursing vs therapist-led rehabilitation of equal dose	Motor function, ADL, disability
Nadeem et al., 2024	RCT	Targeted therapeutic exercise (core stability) - Core-muscle strengthening exercises plus routine physiotherapy vs routine physiotherapy alone	Trunk balance, functional mobility

Thematic Synthesis

Types of exercise rehabilitation within nursing care and their effects on functional recovery (RQ1)

The included studies revealed several distinct but overlapping models of exercise rehabilitation delivered within nursing care. A first cluster comprised nurse-coordinated multidisciplinary and pathway-based rehabilitation, in which nurses organized and guided rehabilitation exercises as part of structured care pathways. Zhang et al. (Zhang et al., 2024) demonstrated that a multidisciplinary clinical nursing pathway incorporating guided rehabilitation exercises significantly improved activities of daily living and neurological function while reducing complications and enhancing satisfaction. Complementing this, theory-guided rehabilitation nursing improved Barthel Index, neurological status, quality of life, and, notably, patients' adherence to rehabilitation exercise (Li et al., 2021). These findings indicate that nursing structures can improve not only functional outcomes but also the behavioral processes-such as adherence-on which exercise effectiveness depends (Li et al., 2021).

A second cluster comprised nurse-led continuous, transitional, and home-based exercise programs designed to extend rehabilitation beyond hospitalization. An advanced-practice-nurse-guided home-based exercise program improved spasticity, motor function, walking ability, and activities of daily living in patients with lower-limb spasticity (Chen et al., 2021), and a nurse-initiated transitional home-based care program improved quality of life, symptoms, self-efficacy, and activities of daily living (Yuet Wong et al., 2022). Continuous nursing combined with constraint-induced movement therapy delivered through a health platform yielded superior upper-limb function, trunk control, quality of life, and gait relative to routine rehabilitation (Yingying et al., 2022). Nursing-theory-based delivery of physical rehabilitation during hospitalization was likewise illustrated in a recurrent cerebrovascular-accident case (Hermawan & Wihardja, 2021). A third cluster incorporated technology-assisted and adjunctive exercise, including virtual reality with an intelligent exercise rehabilitation machine for lower-limb recovery (Lv & Chen, 2022) and multimodal exercise combined with supportive music and imagery for post-stroke mood (Mao et al., 2025). Targeted therapeutic exercise, such as core-muscle strengthening, improved trunk balance and functional mobility (Nadeem et al., 2024), while intensive functional training restored independence in a complex case (Nagai & Yamaguchi, 2017). A nurse-led self-care guideline further embedded physical exercise within a broader self-management framework (Putra et al., 2024). Across these clusters, exercise rehabilitation delivered within nursing care was consistently associated with improved functional recovery (Chen et al., 2021; Yuet Wong et al., 2022; Zhang et al., 2024).

Comparative effectiveness against usual care and other interventions (RQ2)

With respect to comparative effectiveness, the included controlled studies consistently favored exercise rehabilitation embedded in nursing care over usual or conventional care across mobility, balance, activities of daily living, and quality-of-life domains. Nurse-guided and nurse-coordinated interventions outperformed routine care on activities of daily living and neurological function (Li et al., 2021; Zhang et al., 2024), on quality of life and self-efficacy (Yuet Wong et al., 2022), and on upper-limb function and gait (Yingying et al., 2022). Core-stability exercise added to routine physiotherapy produced greater gains in trunk balance and functional mobility than physiotherapy alone (Nadeem et al., 2024), echoing broader evidence that targeted exercise augments usual rehabilitation (Gamble et al., 2021). Technology-assisted exercise similarly enhanced lower-limb motor recovery relative to conventional treatment (Lv & Chen, 2022).

Importantly, one assessment-blinded non-inferiority trial found that rehabilitation delivered by trained nurses was non-inferior to therapist-led rehabilitation of equal dose on motor and disability outcomes (Wang et al., 2021), suggesting that appropriately trained nursing staff can deliver effective exercise rehabilitation and thereby expand rehabilitation capacity. These functional gains are consistent with meta-analytic evidence that exercise

improves quality of life, balance, and gait after stroke (An & Shaughnessy, 2011; Chen & Rimmer, 2011), and with the recognized benefits of home-based and caregiver-supported models (Bernocchi et al., 2016; Vloothuis et al., 2016). However, effect sizes and outcome measures varied, and some benefits-such as improvements in mood and well-being from exercise combined with psychosocial support (Mao et al., 2025)-extended beyond conventional motor endpoints, aligning with reviews of psychosocial and mood interventions after stroke (Balram et al., 2025; Chen et al., 2022; van Nimwegen et al., 2023). Overall, the evidence indicates that exercise rehabilitation within nursing care is at least as effective as, and frequently superior to, usual care, while being potentially non-inferior to therapist-led delivery (Wang et al., 2021).

Comparative and Critical Analysis

Methodologically, the evidence base was dominated by randomized and non-randomized controlled trials, supplemented by a rigorous cluster-trial process evaluation (Salbach et al., 2017), a consensus study (Putra et al., 2024), and case reports (Hermawan & Wihardja, 2021; Nagai & Yamaguchi, 2017). This distribution reflects a field maturing toward experimental designs but still reliant on small, single-center studies with heterogeneous outcome batteries. Several trials used unblinded designs or quasi-randomization (Lv & Chen, 2022; Yingying et al., 2022), and outcome measures ranged widely-from the Fugl-Meyer Assessment and Barthel Index to disease-specific quality-of-life scales-limiting direct comparison. The process evaluation is instructive: despite substantial facilitation, teams could not integrate all recommended treatments simultaneously (Salbach et al., 2017), underscoring that implementation fidelity, not merely intervention efficacy, shapes real-world outcomes. Underused designs-including adequately powered multi-center trials, longitudinal follow-up, and economic evaluation-represent clear opportunities. The concentration of studies in a small number of countries further constrains generalizability, a pattern also noted in broader rehabilitation syntheses (Saraiva et al., 2023; Teodoro et al., 2024).

Discussion

Interpreted collectively, the findings indicate that nursing care is not merely a supportive backdrop to exercise rehabilitation but can be an active vehicle for its delivery, coordination, and maintenance after stroke. The consistency of functional benefits across nurse-coordinated pathways (Li et al., 2021; Zhang et al., 2024), nurse-led home and transitional programs (Chen et al., 2021; Yuet Wong et al., 2022), and technology-assisted or adjunctive exercise (Lv & Chen, 2022; Mao et al., 2025) suggests that the nursing role adds value through continuity, education, adherence support, and integration of physical and psychosocial care. The non-inferiority of nurse-delivered rehabilitation to therapist-led care (Wang et al., 2021) is particularly significant for workforce-constrained systems.

Theoretically, these findings extend rehabilitation frameworks that have historically centered on therapist-delivered exercise by foregrounding nursing as a locus of rehabilitation delivery (De Man-Van Ginkel et al., 2010; Mi et al., 2024). Several studies were explicitly theory-guided (Hermawan & Wihardja, 2021; Li et al., 2021), reinforcing calls to ground nurse-delivered exercise in behavioral and self-management theory to sustain adherence (Gwynne-Mayer et al., 2025). Practically, the evidence supports embedding structured exercise into nursing workflows across the care continuum-from inpatient pathways to transitional and home-based programs supported by telehealth and caregivers (Bernocchi et al., 2016; Koç, 2015; Vloothuis et al., 2016; Yuet Wong et al., 2022)-and equipping nurses with structured movement protocols (Miller et al., 2020). For practitioners and policymakers, task-sharing appropriately trained nursing staff into rehabilitation delivery may improve access without compromising outcomes (Wang et al., 2021).

Compared with prior reviews that synthesized therapist-delivered exercise for balance, gait, and quality of life (An & Shaughnessy, 2011; Chen & Rimmer, 2011; Machado et al., 2022), this review foregrounds the delivery context and identifies nursing as an underrecognized but effective conduit for exercise rehabilitation. Some tensions remain in the literature: benefits were most consistent for activities of daily living and quality of life, whereas effects on discrete motor endpoints were more variable (Wang et al., 2021; Yingying et al., 2022), and implementation studies caution that not all recommended treatments are readily integrated in practice (Salbach et al., 2017). Such contradictions likely reflect heterogeneity in intervention intensity, delivery fidelity, and outcome selection rather than fundamental disagreement about the value of exercise.

Several research gaps emerge. First, the optimal dose, format, and delivery model of nurse-delivered exercise remain undefined, as does its cost-effectiveness. Second, long-term outcomes and sustained adherence are underexamined, despite adherence being a recognized determinant of success (Gwynne-Mayer et al., 2025). Third, the geographic concentration of evidence limits transferability across health systems. This review also has limitations. It searched a single database (Scopus), restricted inclusion to English-language articles, and relied on a narrative synthesis owing to heterogeneity, which precludes pooled effect estimates; the inclusion of case reports and an unblinded or quasi-randomized subset also tempers the strength of conclusions.

Accordingly, the future research agenda should prioritize adequately powered, multi-center randomized trials with standardized, functionally meaningful outcomes and long-term follow-up; direct comparisons of nurse-delivered versus therapist-delivered and technology-supported models, including economic evaluation; and implementation studies that address fidelity and scalability across diverse settings. In summary, in answer to RQ1, effective exercise rehabilitation within nursing care spans nurse-coordinated multidisciplinary pathways, nurse-led continuous, transitional, and home-based programs, and technology-assisted or adjunctive exercise, all associated with improved functional recovery. In answer to RQ2, such interventions were consistently more effective than usual care for mobility, balance, activities of daily living, and quality of life, and were non-inferior to therapist-led rehabilitation.

Conclusions

This systematic review synthesized 13 studies on exercise rehabilitation delivered within post-stroke nursing care and found that nurse-coordinated pathways, nurse-led continuous, transitional, and home-based programs, and technology-assisted or adjunctive exercise consistently improved functional recovery, including activities of daily living, motor function, balance, mobility, and quality of life. Compared with usual care, these interventions were more effective, and nurse-delivered rehabilitation was non-inferior to therapist-led treatment, underscoring the value of nursing as an active vehicle for exercise rehabilitation. The core contribution of this review is to reframe nursing from a supportive backdrop to a central conduit for sustained, accessible rehabilitation. In practice, embedding structured exercise into nursing workflows may expand rehabilitation capacity. These conclusions are tempered by single-database searching, heterogeneity, and variable study quality, and call for adequately powered, standardized, and long-term trials.

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