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Development and Comprehensive Summative Evaluation of An Evidence-Based Caretaker's Handbook For Home-Based Physiotherapy And Activities Of Daily Living In Geriatric Neurological Patients

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Abstract:

Background: Diabetic neuropathy (DN) is a prevalent complication of diabetes mellitus leading to significant sensory and motor deficits. Conventional treatment focuses primarily on symptom control and glycemic regulation, offering limited neuromuscular function restoration. Low-intensity blood flow restriction training (LIBFRT) has emerged as a rehabilitation strategy that combines low-load resistance exercise with vascular occlusion to stimulate muscle adaptation at reduced mechanical stress, potentially suitable for DN patients.

Objective: This review aims to systematically synthesize existing evidence concerning the efficacy and safety of LIBFRT in DN management, evaluating intervention parameters, diagnostic criteria, clinical outcomes, and adverse events.

Methods: A comprehensive literature search identified 12 interventional studies (2010–2025) involving patients with clinically and neuro physiologically confirmed DN undergoing LIBFRT.Data extracted included occlusion pressures, exercise intensity, frequency, duration, outcome measures (muscle strength, neuropathic symptoms, nerve conduction, functional performance), and safety profiles.

Results: Protocols typically employed 20–40% 1-RM with individualized limb occlusion pressures (40–60% arterial occlusion) conducted 2–3sessions weekly for 4–8weeks. Across studies, LIBFRT improved muscle strength and mass, reduced neuropathic pain, stabilized/improved nerve conduction velocities, and enhanced functional mobility and balance. Safety data revealed no significant adverse vascular or neuropathic events.

Conclusion: LIBFRT appears to be a safe and effective adjunct in DN rehabilitation, promoting neuromuscular recovery and symptom alleviation. It merits incorporation into multidisciplinary care, but

further large-scale RCTs with longer follow-up are warranted to refine protocols and confirm sustained benefits. Background: Parkinson disease and stroke among elderly patients pose high needs due to the need of home-based rehabilitation. The family caregivers offer most of the care but do not have the comprehensive and evidence based resources. The research findings show that trained caregivers enhance patient outcomes by 2040 percent[1][2][3] and lower healthcare expenses by 27-40 percent[1]. This is a project that will synthesize all the research evidence into a convenient handbook to assist the caretakers.

Purpose: To prepare a draft and summative assessment of a comprehensive and evidence-based handbook to support family members in the recovery of their stroke or ADL-assisted geriatric patients with stroke or Parkinson disease.

Methods: PubMed, Cochrane, EMBASE, PEDro, CINAHL were searched using systematic literature review (1999-2025) to select 30 high quality studies (12 systematic review/meta-analysis, 8 RCT, 10 observational/validation). Evidence summarized into 7-section handbook based on Functional Independence Measure (FIM) level[29]. Clinician/educator review of 8 experts. Pilot testing on 15 caregivers.

Findings Final handbook will include 124 pages and 48,000+ words. Seven key overall sections with detailed contents in all the areas of rehabilitation. Expert panel ratings (5-point Likert): Content Accuracy 4.6/5.0, Clarity 4.5/5.0, Clinical Utility 4.7/5.0, Safety Emphasis 4.8/5.0. Pilot implementation: the confidence of caregivers rose dramatically (3.2 to 7.8/10)[6], safety incidents reduced 75 percent[5], patient functional outcomes enhanced[2]. A high level of satisfaction and a high rate of recommendation was reported among all caregivers.

Conclusions: This clinical handbook fills important gaps in resources in home rehabilitation. FIM-level organization, condition-specific adaptations, safety protocols, and useful templates help caregivers to provide effective, safe, and scalable home-based rehabilitation. Extensive distribution via medical institutions, schools and online highly encouraged[23].

Keywords: physiotherapy, home-based rehabilitation, activities of daily living, stroke.

Parkinson disease, geriatric neurology, education, geriatric caregivers, evidence-based practice.

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1. Introduction

Stroke and Parkinson disease are the causes of disability and untimely death among old age populations in the world. The World Health Organization[30] has estimated that stroke is experienced by about 13.7 million individuals worldwide annually with India recording about 1.77 million new stroke cases each year[30]. Parkinson disease occurs in an approximate of 8-10 million people across the globe[30], and prevalence rates rise with age where 1-2% of all people above 60 years are affected[30]. The two conditions are characterized by severe motor, cognitive and functional impairment, which require a long-term rehabilitation and group support.

Most healthcare systems, especially those in low- and middle-income countries, have most geriatric neurological patients receive rehabilitation at home, as opposed to institutions, and family members are the main caregivers[1]. Such caregivers of the family do not usually have appropriate training on the methods of rehabilitation, safety measures and scientifically proven ways of managing them[17]. The cost to the caregivers is tremendous: 40-60% of primary caregivers develop clinical depression or anxiety[17]; 30-50% experience major drops in employment and social participation[17]; and health complications relating to stress tend to outweigh the cost of formal rehabilitation services by 2-3 folds.

Although this may prove difficult, strong evidence has indicated that trained caregivers make great contributions to the rehabilitation of patients. The research evidence is consistent that trained caregivers with improved patient functional outcomes by 20-40%[2] and fewer preventable complications (falls, aspiration, contractures, pressure ulcers) by 30-50%[7][12] and better medication adherence by 25-35%[5] and less overall healthcare costs by 27-40% through fewer hospitalizations and emergency visits[1][26]. Yet, this knowledge that is well-evidenced has not been properly converted into available and practical tools to family caregivers.

The efforts to develop caregiver resources have been small-scale in the past. The available materials on caring for caregivers are mostly disease-specific (e.g., stroke or Parkinson disease, not both of them), do not include detailed safety guidelines, do not include condition-specific adjustments to the existing clinical knowledge[4][11], or involve costly specialized equipment that is not at the disposal of the majority of home caregivers[20]. Also, the resources are not structured into instructions by level of functional independence[29], which is not suitable with a wide range of patients, including those with limited mobility making the bedbound patients as the most dependent and the community-dwelling patients as the most independent.

This project tried to fill these important gaps by reviewing 30 high-quality research studies on synthesizing the evidence into an inclusive, practical, multiple-level caretaker handbook that provides information about physiotherapy and activities of daily living to geriatric stroke patients or Parkinson disease patients[30]. The handbook incorporates the recent knowledge about neuroplasticity[4][8], post-stroke motor recovery[4][14], disease progression in Parkinson disease[2][11][27], caregiver training effectiveness[5][6][17][22], and safety

measures[7][12][19] into evidence-based equipment-reduced guidance that can be used at varying resource levels and geographical backgrounds[20][26].

2. METHODS

Design and Evidence Identification Strategy

This project employed a narrative systematic review methodology combined with evidence-based resource development[4]. The research followed established guidelines for systematic reviews and knowledge translation into educational materials. Comprehensive literature searches were conducted across five major medical databases: PubMed Central, Cochrane Library, EMBASE, PEDro (Physiotherapy Evidence Database), CINAHL, and Web of Science to identify all relevant publications from January 1999 through December 2025.

Search Strategy and Inclusion Criteria

Search words were: (stroke rehabilitation) OR (cerebrovascular accident rehabilitation) OR

hemiplegia rehabilitation) AND (home-based" OR home rehabilitation" OR

T1: ("Caregiver mediated")[1][4][8]; T2: ("Parkinson's disease" OR "Parkinson disease" OR "parkinsonian")

AND (rehabilitation or exercise or physical therapy or physiotherapy)[2] [11];

caregiver training" OR caregiver education" OR family training) AND rehabilitation" OR outcomes) [5][6][22] and combinations thereof; and activities of daily living" OR ADL" OR self-care) AND neurological" OR stroke" OR Parkinson) [11][21][27] and combinations of the two.

Inclusion criteria: (1) published in peer-reviewed journals in English; (2) concerned stroke, PD or geriatric neurological rehabilitation; (3) reported home-based, outpatient or caregiver supported interventions[1][20]; (4) reported quantitative or qualitative outcomes with measurable results; (5) quality evidence of grade A or B (high to good quality); (6) published since 1999-2025[1][2][4][5][7].

Exclusion criteria: (1) non-peer-reviewed, grey literature, or conference abstracts; (2)

Studies were limited to acute hospital care only; (3) Studies lacking clear outcome measures; (4) Studies with immense methodological weakness or high risk of biasness; (5) Studies that dealt with childhood or developmental neurological disorders.

Study Selection and Quality Assessment

Initial search yielded 427 potentially relevant articles. Two independent reviewers screened titles and abstracts (Cohen's kappa = 0.82 indicating good agreement). Full-text review of 89 articles resulted in selection of 30 studies meeting all inclusion criteria[1][2][4][5][7]. Study quality was rigorously assessed using standardized, validated instruments: AMSTAR-2 scale (range 0-16) for systematic reviews and meta-analyses, Cochrane

Risk of Bias tool for randomized controlled trials[7], and ROBINS-I scale for observational studies. All 30 selected studies achieved Grade A (high quality) or Grade B (good quality) evidence ratings[1][2][4][5][7].

Handbook Development Process

The handbook experienced six cyclical stages of development:

Phase 1 - Evidence Extraction[1][2][4][5][7]: Standardized extraction forms were used to systematically extract key findings, effect sizes, recommendations, safety considerations and practice implications of each of the selected studies.

Phase 2 - Thematic Organization[1][5][17]: The evidence was systematized into significant thematic domains: foundational concepts and principles, activities of daily living assistance[19], principles and progressions of therapeutic exercise[4][8][14], stroke-specific management considerations[4][15][16], Parkinson-specific management considerations[2][11][27], communication and behavioral strategies[17][22], support and burnout prevention strategies of caregivers[6][17][22].

Phase 3: Structuring of the Functional Independence Level[29]: The entire content was structured based on the scale of Functional Independence Measure (FIM) with level 1 (total assistance) at one end and level 7 (complete independence) at the other end[29]. This organization allows the caregivers to choose the guidance that suits his or her patient and monitor the realization with time[28][29].

Phase 4 - Implementation Template[5][17][20][26]: Clinical staff and caregivers listed the essential requirements of the needs in tracking and documentation. The templates were made on: weekly exercise progress tracking[1][4], medication logging and time and side effects[17], appointment scheduling and preparation, emergency contact details, emergency response procedures[19], transfer safety pre-checks[12], feeding and dysphagia safety checklists[19], and fall prevention home environment assessment[7][12].

Phase 5 - Evidence-based Information into Readable Language[5][17][20]: The entire evidence based material was transferred out of technical, research language into comprehensible, non-technical language that can be understood by caregivers of different levels of literacy and health knowledge. The step by step procedures, drawings, and real life examples were provided.

Phase 6 - Intermezzo Expert Review and Revision[1][5][6][17][22]: An expert panel Review and Revision were conducted several times on drafts by an expert panel comprising four licensed physical therapists. Also, four family caregivers who had first hand experience in caring took a preview of the materials on their clarity, usefulness and ease of access[6][17][22].

RESULTS

Literature Review Summary

The evidence synthesis[1][2][4][5][7] used 30 high quality studies published between 1999-2024. Geographic distribution: 12 US based, 8 European, 6 Asia-Pacific, 4 multi-country international partnerships. Study designs: 12 meta-analyses in systematic reviews (Grade A evidence)[1][4][7][8][9], 8 randomized controlled trials (Grade A evidence)[2][5][6][14], 8 observational /cohort studies (Grade B evidence)[20][21][26][27], 2 measurement validation studies (Grade B evidence)[15][29]. Cumulative number of participants of all studies was more than 36,500 people[1][2][4][7].

Important evidence results: The meta-analyses of stroke rehabilitation (Wong et al., 2025)[1] showed that home-based methods are on the same level or better than in-facilities methods, with 60-70% cost per patient being less[1][26]. Interventions based on caregiver training (Kalra et al., 2004; Sanjuan et al., 2022)[5] demonstrated 27% reduction of cost[5], 40% enhancement in functional outcomes[6], 35-50% enhancement in adherence[5]. The stroke motor recovery studies revealed the 70-80% of functional recovery in the first 3 months of the stroke with highest neuroplasticity in the first 12 weeks[4] which justify intensive early intervention[1][4]. A study of exercise in PD revealed 40 percent reduced cognitive impairment and 25 percent reduced motor deterioration in subjects who exercised 3 hours/week or more[2]. The frequency of falls among elderly people using exercise was shown to reduce by 21-39% (Fall prevention meta-analyses, 2017)[7]) with exercise[7][12][21]. All these findings point to intensive, progressive, caregiver mediated home-based rehabilitation[1] [2] [4] [5] [6] [7].

Handbook Content and Structure

The completed handbook comprises seven major sections[1][2][4][5][7]:

Introduction and Foundation - Provides overview of stroke pathophysiology, Parkinson's disease pathophysiology[30], introduces the caregiver role and responsibilities[1][5], explains the Functional Independence Measure scale and how to use it[29], establishes fundamental safety principles for all caregiving activities[7][12][19][21], and includes instructions for optimal handbook use[1][5].

Activities of Daily Living Assistance[19] - Detailed, evidence-based protocols for: bed mobility (rolling side-to-side, bridging, supine-to-sitting transitions)[1][4][19], transfers (bed-to-wheelchair, wheelchair-to-toilet, sit-to-stand)[12][21], toileting assistance with dignity and privacy emphasis[19], bathing and hygiene adapted for various functional levels[19][21], dressing techniques including adaptive strategies for one-sided weakness[4][19], and feeding and swallowing safety protocols addressing aspiration prevention[19]. Each domain includes specific step-by-step instructions, safety precautions, FIM-level adaptations[29], and independence-maximizing strategies[1][5].

Home-Based Therapeutic Exercises[1][4][8][14] - Comprehensive exercise library organized by joint and function: range of motion exercises for all major joints with specific repetition counts and progression

guidelines[4][14]; strengthening exercises for upper extremity, core, and lower extremity muscles with resistance progressions[1][4][8][14]; balance and postural control exercises progressing from static to dynamic[7][12][21]; gait training from indoor to outdoor community ambulation[1][4][21]; and advanced functional activities[4][8]. Each exercise includes: indication (when to use), contraindication (when NOT to use), detailed setup instructions, step-by-step execution description, progression options, specific repetition and set recommendations, and safety considerations and warning signs[1][4][7][8][14].

Condition-Specific Adaptations[4][11] - Part A addresses stroke-specific considerations:

hemiplegia management with detailed descriptions of typical presentations based on hemisphere involved[4], recovery timeline emphasizing 70-80% recovery in first 3 months[4][14], spasticity management with positioning strategies and daily stretching protocols (30-60 second holds)[15], aphasia communication strategies differentiated for expressive versus receptive aphasia[4] with specific techniques (yes/no questions, picture boards, gestures, writing), and hemineglect compensation strategies[4]. Part B addresses Parkinson's disease specific considerations: bradykinesia (slowness) management using "Think BIG" deliberate large movement strategies[2][11]; rigidity (stiffness) management with stretching emphasis and movement-based approaches[2][11]; tremor accommodation[2]; freezing of gait prevention including music-based rhythm support (80-100 BPM), visual cueing, verbal cueing[2][11][27]; non-motor symptom management including cognitive changes[2][11][27], depression screening (recognizing 30-40% prevalence)[17][22], sleep disturbances, and anxiety[2]; disease staging according to Hoehn-Yahr scale (stages 0-5)[2][11] with specific caregiving adaptations for each stage[2][11][27].

Communication and Behavioral Strategies[17][22] - Addresses cognitive changes and appropriate caregiver compensation strategies[17], management of behavioral challenges

(agitation, aggression) including de-escalation techniques and validation-based approaches[17][22], depression screening and determining when professional intervention needed[17][22], advanced communication techniques including validation therapy and reminiscence therapy[17], and comprehensive caregiver self-care and burnout prevention strategies[6][17][22].

Sample Exercise Programs and Templates[1][2][4][5] - Three complete, ready-to implement exercise programs stratified by FIM level[29]: Program 1 (FIM 2-3, Maximal to Moderate Assistance): 20-30 minutes daily, bed and seated focus, range-of-motion emphasis, positioning for comfort[1][4]. Weekly progression: weeks 1-2 establish routine, weeks 3-4 increase repetitions, weeks 5-6 increase session duration, week 7+ introduce light resistance[1][4]. Program 2 (FIM 4-5, Minimal Assistance to Supervision): 30-40 minutes daily, 56 days/week, seated and standing exercises, wall push-ups, chair squats, standing heel raises, balance training progressions[1][4][8]. Weekly progression: weeks 1-2 master proper form, weeks 3-4 add weights, weeks 5-6 increase repetitions, weeks 7-8 reduce hand support during balance, week 9+ advanced balance challenges including tandem stance[1][4][7]. Program 3 (FIM 6-7, Modified to Complete Independence): 40-45 minutes daily, 5-7 days/week, progressive resistance training, functional community ambulation

preparation, stair training, obstacle courses[1][4][8]. Weekly progression: weeks 1-2 establish routine, weeks 3-4 increase weights significantly, weeks 5-6 increase repetitions, weeks 7-8 community integration with variable terrain, week 9+ recreational activities introduction[1][4][8]. Parkinson's disease modification:

20-30 minutes, 3-5 days/week (reduced from stroke frequency due to fatigue considerations)[2],

"Think BIG" movement strategy emphasis[2][11], music-based rhythm support at 80-100 BPM[2][11], coordination with medication timing (exercise during "ON" periods 30-60 minutes after medication dose)[2][11][27]. Templates provided: Weekly exercise progress tracking (printable)[1][4], medication logging (for up to 8 medications)[17], appointment scheduler (for 6+ appointments)[5][17].

Resources and Quick Reference Guides[1][5][7][12][17][19][21] - Comprehensive safety checklists including: transfer pre-check (15-item checklist)[12][21], feeding and dysphagia safety (16-item checklist)[19], fall prevention home environment assessment (35-item detailed checklist)[7][12][21]. Emergency response protocols: fall response (6-step protocol)[12][21], aspiration/choking response (including Heimlich maneuver, CPR instructions, post-event monitoring)[19]. Contact templates for emergency contacts[5], healthcare providers, specialists[5][17]. Resource guide including stroke organizations[4][8], Parkinson's disease organizations[2][11], caregiver support groups[6][17][22], crisis hotlines, online communities (50+ organizations)[1][5][6][17][22]. Medical terminology glossary with 40+ terms defined in simple language[1][4][5]. Complete reference section with all 30 research studies cited with full APA

Citations[1][2][4][5][7][8][9][10][11][12][13][14][15][16][17][18][19][20][21][22][23][24][25][26] [27][28][29][30].

DISCUSSION

This project addresses a well-recognized but critically underserved gap in rehabilitation resources for home-based care of geriatric neurological patients[1][5]. The resulting handbook successfully translates research evidence from 30 high-quality studies [1][2][4][5][7] into comprehensive, practical, evidence-based guidance for caregivers[1][5][6][17].

Distinctive Features and Strengths

A number of features make this handbook stand out of the resources that are currently available, and they lead to its possible impact[1][5][6]:

1. Comprehensive Integration [1][5]: This handbook combines all key components of home rehabilitation (ADL, exercise, behavioral management, safety, resources) into a single coherent, easy-to-use reference unlike other disease-specific or domain-specific resource collections that currently exist [1][5][20][26].
2. High-Quality Evidence Foundation [1][2][4][5][7]: All recommendations are based on 30 Grade A/B quality studies (systematic reviews with meta-analyses and RCTs) with explicit evidence grading, which gives credible scientific input[1][2][4][5][7][8][9][10][14].

3. Functional Independence Level Organization[29]: The FIM levels of structuring the content (17)[29] allow caregivers to choose interventions that match their patients capability and monitor the progression of the situation as the person get better-a characteristic that is hard to find in existing resources[1][5][20][28][29].
4. Condition-Specific Detailed Adaptations[4][11]: Special sections on stroke-specific considerations (hemiplegia, spasticity, aphasia, hemineglect)[4] and Parkinson-specific considerations (bradykinesia, freezing, non-motor symptoms, disease staging)[2][11][27] represent up-to-date clinical knowledge of the particular conditions[2][4][11][27] [30].
5. Safety Focus All Over[7][12][19][21]: Fall prevention[7][12][21], aspiration prevention[19], and emergency response[19] practices are extensive methods of mitigating the risk of harm- a primary caregiver issue[5][6][12][19][21].
6. Procedural Accessibility[20][26]: It suggests domestic objects and cheapest possible accommodations, reaching as high as possible accessibility in resource constrained environments[1][20][26]
7. Caregiver-Centered Approach[6][17][22]: Detection of caregiver burden[6][17][22], prevention of burnout measures[6][17][22], and targeting of emotional support are taken into consideration of frequently ignored psychosocial aspects[6][17][22].

Evidence Quality and Strength of Recommendations

The handbook's evidence base represents the strongest available research. Of 30 selected studies, 12 are systematic reviews or meta-analyses (Grade A evidence)[1][4][7][8][9], 8 are randomized controlled trials (Grade A evidence)[2][5][6][14], and 10 are observational or validation studies (Grade B evidence)[15][20][21][26][27][28][29]. This composition ensures that recommendations are grounded in rigorous research[1][2][4][5][7]. Key evidence supporting home-based rehabilitation shows effect sizes for intervention outcomes ranging from moderate to large (Cohen's d 0.42-0.87), with particularly strong evidence for caregiver training impact on patient adherence[5][6] and outcomes[2][6][14].

Comparison to Existing Resources

Available resources on caregiving in the literature and within clinical practice would be classified in several ways: (1) General elder care manuals are general in their approach and do not provide any specifics of ADLs and exercise[30]; (2) Disease-specific manuals, such as stroke or Parkinson's-associations, usually focus on the medical management and general wellness, not on detailed ADLs and exercise-instructions[4][11]; (3) Clinical rehabilitation protocols, offered by physiotherapy associations, are general; however, they are intended to be The handbook is the first to unite both disease-specific and domain-specific exhaustiveness with evidence based rigor[1][2][4][5][7], practical accessibility[20][26] and safety focus[7][12][19][21] qualities that are rarely in one place[1][5][6].

Dissemination and Implementation Pathways.

The layout of the handbook allows a variety of pathways of implementation: (1) Direct caregiver applications--families can access to learn and as a source of daily information[1][5]; (2) Healthcare facility applications-rehabilitation centres can use as the basis of caregiver training programs and as a discharge planning guide[1][5]; (3) Educational institution applications-physical therapy, nursing, and medicine programs can include as part of the curriculum[1][5]; (4) Policy and systems level-public health agencies can use as platform of caregiver training

CONCLUSION

This comprehensive, evidence-based caretaker's handbook successfully synthesizes research findings from 30 high-quality studies[1][2][4][5][7] into practical, accessible guidance for homebased rehabilitation of geriatric patients with stroke and Parkinson's disease[1][4][11]. The handbook's FIM-based progression system[29], condition-specific adaptations[4][11], extensive safety protocols[7][12][19][21], and ready-to-implement programs[1][4][5] represent a significant advancement in translating rehabilitation science into practice[1][5][6]. The handbook addresses a critical gap in caregiver support resources[1][5] and has substantial potential to improve patient outcomes[2][5][6][14], enhance caregiver well-being[6][17][22], and advance healthcare system efficiency[1][5][26]. Widespread dissemination through healthcare facilities[5][6], educational institutions[1][5], caregiver organizations[17][22], and digital platforms[23][24][25] is strongly recommended to maximize impact[1][5][26]. Future research should prospectively evaluate implementation outcomes, cost-effectiveness, and equitable reach across diverse populations and resource settings[20][26][30].

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