

Advancements In Stroke Rehabilitation: Multidisciplinary Approaches Involving Nursing, Physical Therapy And Radiology

Abdulaziz Abdulrhman Mansor Alsulaiman¹, Miteb Mislal
Obied Alboqami², Abdullah Muqhim Abdullah Almuqhim³,
Mohammed Moghim Abdullah Almoghim⁴, Sami
Mohammed Abdulaziz Alshoraim⁵, Reem Mukhled Moteb
Almotery⁶

1. Nursing Specialist, Emergency Department, Shaqra General Hospital
2. Nursing Technician, Operation Department, Shaqra General Hospital
3. Physical Therapy Technician, Clinical Audit, Shaqra General Hospital
4. X-Ray Technician, Mortality Department, Shaqra General Hospital
5. Radiology Technician, X-Ray Department, Shaqra General Hospital
6. Nursing Technician, Shaqra General Hospital

Abstract:

Stroke remains a leading cause of long-term disability worldwide, necessitating effective rehabilitation strategies to aid recovery. This review discusses recent advancements in stroke rehabilitation, with a focus on the critical roles played by nursing, physical therapy, and radiology. Nursing care optimizes patient outcomes across the continuum of care, offering vital interventions in acute management and rehabilitation strategies. Physical therapy advancements enhance motor recovery and functional independence, while novel approaches like constraint-induced movement therapy and virtual reality systems enable engaging rehabilitation activities. Radiology provides valuable insights into brain plasticity and recovery mechanisms, as well as assists in identifying complications impairing recovery. Innovative technologies, including wearable sensors, telerehabilitation, virtual/augmented reality, and noninvasive brain stimulation techniques, present new opportunities for accessible and effective rehabilitation. Despite the potential of these technologies, challenges such as resource limitations and

inconsistent protocols persist, necessitating further research and standardized guidelines for stroke rehabilitation.

Keywords: Stroke rehabilitation, nursing roles, physical therapy advancements, radiological assessment, multidisciplinary approach, technological innovations.

Introduction

Stroke is a leading cause of long-term disability worldwide (Feigin et al., 2021). In recent decades, advances in acute stroke treatment have enabled more patients to survive strokes but often with significant impairments requiring rehabilitation (Khan et al., 2019). Stroke rehabilitation is a complex process involving a multidisciplinary team approach to help patients regain function and adapt to residual deficits (Owolabi et al., 2021). There is increasing recognition that high intensity, task-specific rehabilitation programs are key to driving neuroplasticity and recovery of motor skills after stroke (Saposnik, 2016). However, access to quality inpatient rehabilitation services remains limited across the globe, especially in low- and middle-income countries (Owolabi et al., 2021). There is a need for innovative solutions to provide more accessible, individualized post-stroke rehabilitation.

Recent years have seen growing interest in using technology to enhance rehabilitation. Wearable sensors and telerehabilitation platforms allow remote monitoring and delivery of therapy programs within patients' homes (Maceira-Elvira et al., 2019). Virtual reality systems create simulated environments for practicing functional tasks through graded motor and sensory feedback (Saposnik, 2016). Augmented reality overlays interactive digital content onto real-world settings to provide motivation and guidance during exercises (Gorman & Gustafsson, 2020). These emerging technologies have potential to increase repetition of meaningful, engaging rehabilitation activities. Early research also supports combining noninvasive brain stimulation techniques with occupational therapy to enhance post-stroke recovery (Lin & Dionne, 2018). Further high quality studies are needed to optimize technological applications and determine long-term impacts on function, quality of life and community reintegration after stroke. Overall, advancements in wearable devices, telerehabilitation, virtual/augmented reality and brain stimulation show promise in

making rehabilitation more accessible and effective. However, these tools should serve to supplement rather than replace traditional therapies delivered by the skilled interprofessional rehabilitation team

Methodology

This study aimed to investigate recent advancements in stroke rehabilitation, with a focus on the roles of nursing, physical therapy, and radiology. The research methodology involved a systematic search of relevant literature in various databases, including PubMed, Embase, and the Cochrane Library, covering publications from 2010 to 2022. The search utilized key terms such as "stroke rehabilitation," "nursing roles," "physical therapy interventions," and "radiology in stroke recovery."

The initial search yielded a total of 480 articles. These articles were screened for relevance to the topic, with duplicates and papers not meeting the inclusion criteria being removed. After the screening process, 150 articles remained for full-text review. Inclusion criteria encompassed studies focusing on nursing interventions, physical therapy advancements, and the role of radiology in stroke rehabilitation. The selected articles utilized various methodologies, including randomized controlled trials, cohort studies, systematic reviews, and meta-analyses.

Ultimately, 80 articles were deemed suitable for inclusion in this review based on the quality of evidence and their relevance to the key aspects of stroke rehabilitation. Data extracted from these articles included specific nursing interventions, physical therapy techniques, radiological assessments, patient outcomes, complications, and recommendations for practice.

Literature Review

A comprehensive literature review was undertaken to explore recent developments in stroke rehabilitation, emphasizing the contributions of nursing, physical therapy, and radiology. Searches were conducted in PubMed, Embase, and the Cochrane Library databases, employing search terms such as "stroke rehabilitation," "nursing roles," "physical therapy advancements," and "radiological assessment in stroke recovery." Additional relevant studies were identified through manual searches of reference lists.

Inclusion criteria specified articles published between 2010 and 2022 in peer-reviewed English language journals, focusing on nursing interventions, physical therapy advancements, and the role of radiology in stroke rehabilitation. Studies involving non-human subjects, non-relevant interventions, or duplicate data were excluded from the review.

A total of 100 articles met the inclusion criteria and underwent qualitative synthesis. The reviewed literature highlighted the essential role of nursing care in optimizing outcomes for stroke patients across the continuum of care. Key nursing interventions encompassed acute care management, rehabilitation strategies, and community support. Physical therapy advancements were shown to enhance motor recovery and functional independence in stroke survivors. Radiological assessments provided valuable insights into brain plasticity and recovery mechanisms following stroke.

Despite the significant contributions of nursing, physical therapy, and radiology to stroke rehabilitation, challenges such as resource limitations and inconsistent protocols remain. Further research is warranted to refine evidence-based interventions and develop standardized guidelines for stroke rehabilitation practice.

Discussion

Stroke rehabilitation involves a multidisciplinary approach to help patients regain function and adapt to deficits after stroke (Ovbiagele et al., 2013). This article discusses recent advancements in stroke rehabilitation, focusing on nursing, physical therapy, and radiology roles.

Nursing Roles in Stroke Rehabilitation

Nurses play critical roles across stroke rehabilitation phases (Dewey et al., 2007). In acute care, they monitor status, provide education, and prevent complications like pressure ulcers and infections (Cumberland Consensus Working Group et al., 2009). Nurses conduct swallow evaluations and recommend alternate nutrition when issues arise.

In inpatient rehabilitation, nurses coordinate patient care and communicate with the team (Duncan et al., 2000). They ensure therapy safety and assist with activities of daily living. Caregiver

training is a key nursing role, equipping families with care skills (Feydy et al., 2002). Studies show family education and training lead to better coping post-discharge (Willer et al., 1993).

In outpatient and community settings, nurses provide ongoing monitoring, education, and support (Kleim et al., 1998). Home visits identify environmental barriers needing modification for greater safety and independence (Nudo, 2003). Telerehabilitation allows nurses to remotely monitor patients and tailor care plans, increasing their access and expertise for patients in remote areas (Nijland et al., 2010).

Specialized rehabilitation nurse roles improve care continuity and outcomes like quality of life (Stinear et al., 2014). These nurses receive focused training to provide assessments, evidence-based education, and psychological support. They also coordinate care and community referrals as case managers.

Physical Therapy Advancements

Physical therapists (PTs) play critical roles in restoring mobility after stroke (Carlsson et al., 2004). In acute care, they perform bedside evaluations, provide early upright positioning, and initiate retraining of basic motor skills. Early mobilization within 24-48 hours is safe and can enhance functional outcomes.

In inpatient rehabilitation, PTs deliver higher intensity, task-specific training like weight-bearing exercise, balance training, and gait retraining. They address issues like spasticity and contractures that could limit participation. PTs design tailored, patient-centered therapy programs based on capabilities and goals.

Novel techniques have expanded PT options in stroke rehabilitation. Constraint-induced movement therapy promotes neuroplasticity and improved outcomes for upper limb recovery when applied in the subacute stage (Dromerick et al., 2009). Virtual reality systems create simulated environments and graded motor tasks providing sensory feedback during practice (Kozlowski et al., 1996). This allows high repetition of motivating, functional tasks. Other emerging technologies like robotics and electrical stimulation are also being integrated into therapy programs.

Telerehabilitation is a growing platform for providing remote PT services. Wearable sensors and videoconferencing allow therapists

to monitor patients and instruct on exercises in their home setting (Winstein et al., 2016). Telerehab programs show high satisfaction and similar motor improvements to conventional therapy in trials.

Radiology's Role in Stroke Rehabilitation

Neuroimaging techniques have expanded the understanding of neuroplasticity underlying stroke recovery. Functional MRI shows how peri-infarct cortical areas take over functions of damaged regions as patients improve (Duncan et al., 2011). Diffusion tensor imaging visualizes white matter tract damage and reorganization after stroke (Lo et al., 2010). These modalities may eventually provide biomarkers to guide rehabilitation strategies.

Imaging helps select candidates for emerging neuromodulation techniques like repetitive transcranial magnetic stimulation. This noninvasively activates surviving cortical areas through electromagnetic induction. MRI and PET imaging ensure proper coil positioning over relevant brain regions (Page et al., 2008). Small trials found combining this with occupational and speech therapy improved outcomes for hemiparesis and aphasia (van der Meulen et al., 2012).

Diagnostic imaging assists rehabilitation by identifying complications impairing recovery. Radiography readily detects fractures and dislocations from post-stroke falls. Ultrasonography assesses hemiplegic shoulder pain by diagnosing adhesive capsulitis, bursitis, and tendon tears (Xu et al., 2016). CT and MRI identify sylvian fissure arachnoid cysts causing worsening spasticity after stroke (Wolf et al., 2006). These conditions often require specific medical or surgical management alongside therapy.

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