

**A REVIEW ON EVIDENCE-BASED GUIDELINES AND CLINICAL PATHWAYS IN  
STROKE REHABILITATION****Rajakumari Mannepalli\*, Sreenu Thalla and Padmalatha Kantamneni**

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Article Received on 06/02/2020

Article Revised on 27/02/2020

Article Accepted on 17/03/2020

**ABSTRACT**

Increase in stroke-related disability was globally observed over the last 3 decades as high societal burden. Multidisciplinary stroke rehabilitation reduces stroke-related disability both in older and younger stroke survivors of either sex and independent of stroke severity. There is rapidly increasing evidence to support the clinical effectiveness of specific stroke rehabilitation interventions. For best possible clinical practice Evidence-based guidelines can help and promote better outcome. A systematic review of literature indicates that the currently published stroke rehabilitation guidelines have a national background and focus and represent the health care situations in high-income countries. Such knowledge could facilitate a more wide-spread development of valid comprehensive up-to-date evidence-based national guidelines. In addition, the development of genuine international evidence-based stroke rehabilitation guidelines that focus on therapeutic approaches rather than organizational issue, could be used by many to structure regional or local stroke rehabilitation pathways and to develop their resources in a way that will eventually achieve effective stroke rehabilitation. Such international practice recommendations for stroke rehabilitation are currently under development by the World Federation for neuro rehabilitation (WFNR).

**KEYWORDS:** Rehabilitation, stroke, evidence-based guidelines, clinical practice.**INTRODUCTION**

Cerebro vascular accident (CVA) or stroke is the second leading cause of the death third leading cause of disability. Stroke remains one of the major chronic illness worldwide and most prevalent neurological disorder in terms of both morbidity and mortality. Stroke means a sudden death of brain tissue or cells due to an blockage of blood clot, rupture of an artery in brain leads to deficient of oxygen while the blood flow to the brain. It is also a leading cause of depression, dementia.

According to WHO 5.5 million (95%) of death was caused due to stroke in 2016. Where women are 2.6 million and men are 2.9 million. High incidents of stroke occur in East Asia followed by Eastern European region where as lowest rate at central Latin America. Globally in low and middle- income countries in which 70% of stroke and 87% of both stroke related deaths occurred and in last four decades it became doubled, where as its is 42% in high income countries. When compared to those both high and low income countries, Low income country shows more incidence of deaths related to stroke. Socio-economic development of an individual person impacts enormously on stroke recovery. The estimation of risk of stroke was more common in elder age. The risk factors for stroke are similar to that of coronary heart

disease and other vascular diseases in those main factors are hypertension, hyperlipidemia and diabetes. Smoking low physical activity, unhealthy diet and obesity are also leading factors of stroke. Stroke is of two types Ischemic stroke and hemorrhagic stroke in those Ischemic stroke is more common. Ischemic means clot of an blood or cholesterol lead to blockage. Hemorrhagic means rupture of an blood vessel in brain lead to bleeding. By observing clinical features and Based on the investigations of CT scan and MRI it was diagnosed and affected region was confirmed.

There are several scales to measure patients functional outcome after stroke, the most widely used are the Barthel Index (BI), modified Rankin Scale (MRS), both of which aim to distinguish functional dependence from independence. Functional outcome of a patient can also measure by their daily life and activities of daily living (ADL) after stroke, and depends on motor and perceptual functions, as well as language and other cognitive functions. Poor functional outcome after stroke is associated with high age, severe stroke, depression and other comorbidities. Poor outcome 3 months after stroke is highly predictive of death. Several studies have shown that adherence to guidelines for post-stroke secondary prevention, comprehensive stroke follow-up Results less

complications, better quality of life, and better risk factor control with respect to hypertension, cholesterol levels, smoking cessation or body mass index. Based on the guidelines for the management of stroke was recommended. Management of stroke was distinguished between ischemic and haemorrhagic. Combination of stroke management with adequate rehabilitation services, preventive measures, understanding of risk factors associated with stroke may lead to the better recovery from stroke. Due to insufficient knowledge on those in low income countries was leading to more stroke burden.

### **BURDEN OF STROKE**

New stroke, stroke-related deaths, and the number of stroke survivors living in our societies considerably increased leading to a growing burden of disease and related disability.<sup>[1]</sup> From 1990 to 2010 mortality rate was decreased in high income countries (-37%, 95% confidence interval [95% CI] -31 to -41%) and in low- and middle-income countries (-20%, 95% CI -15 to -30%). In the same time stroke-related deaths, number of new stroke survivors, number of stroke survivors living in the society, and lost disability-adjusted life-years all increased (on average by +26, +68, +84, +12%, respectively). Similarly, the Global Burden of Disease Study 2015 group reported an increase of ischemic stroke prevalence (number of stroke survivors living in societies) by 21.8% from 2005 to 2015 (i.e., from 20,467.3 to 24,929.0 thousands) and of years lived with disability by 22.0% (i.e., from 2,999.9 to 3,659.9 thousands) during that time.<sup>[2]</sup> Societies around the globe are well-advised, plan their health-care resources and societal efforts to increase in neuron-disabilities efficiently by undergoing rehabilitation for stroke.

### **STROKE REHABILITATION**

Stroke prevention and effective stroke rehabilitation can decrease the burden of stroke-relating disabilities. By focusing on stroke rehabilitation and ways to promote its effectiveness through evidence-based guidelines. Implemented by clinical pathways at regional or local level such guidelines i.e., structured, multi disciplinary, and multi-step plans of care that then facilitate effective stroke rehabilitation. Dedicated care in multidisciplinary stroke units leads to higher rates of independence with activities of daily living (ADL) it measures functional outcome of a patient after stroke, and depends on motor and perceptual functions, as well as language and other cognitive functions. ADL can be divided into basic ADL functions (activities like dressing, toileting, feeding and mobility) and instrumental ADL functions (including activities like shopping, housework, cooking and transportation). The BI covers only basic ADL functions and has a ceiling effect, while the MRS, which is a six-graded scale based on basic and instrumental ADL functions, covers the whole spectrum from no symptoms to severe disability (and death). And ADL results in less need to receive long-term institutional care after stroke.<sup>[3]</sup> In this Cochrane review, a meta-analysis including 21

randomized controlled trials (RCTS) with a total of 39,994 participants showed a reduced rate of death or institutionalized care (OR 0.78, 95% CI 0.68 to 0.89; P = 0.0003) and death or dependence (OR 0.79, 95% CI 0.68 to 0.90; P = 0.0007) after stroke unit care compared to care in general wards post stroke, without significantly increasing length of stay, and independent of age, sex, or stroke severity.

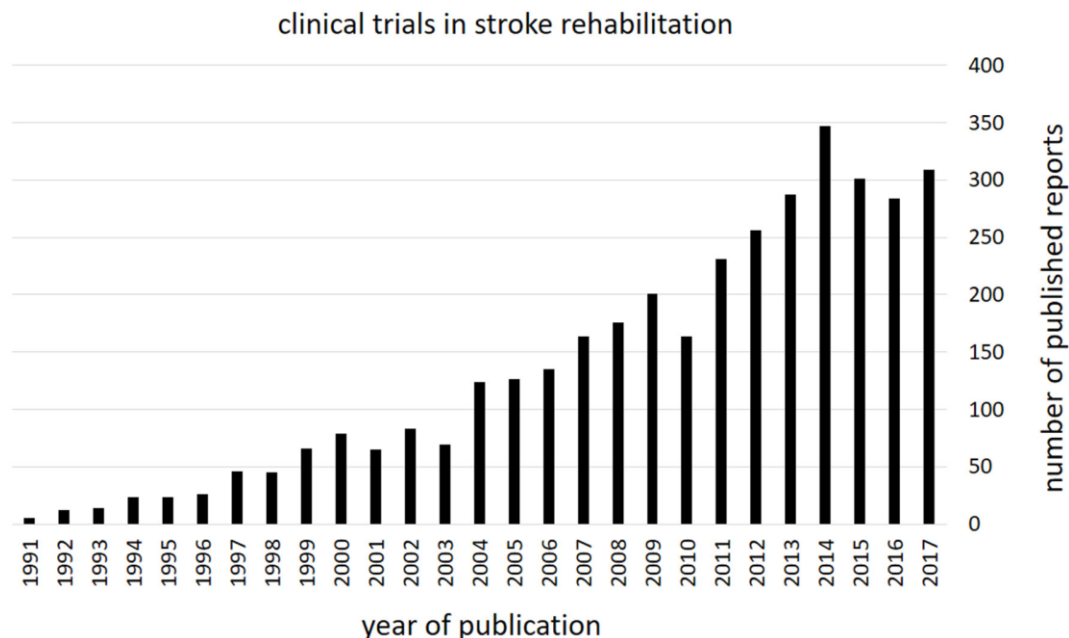
In addition, other specific interventions for stroke rehabilitation promote functional recovery and reduce disability. The use of electro-mechanical gait training increases the number of stroke patients that re-gain the ability to walk<sup>[6]</sup> and the use of treadmill training (with partial body-weight-support) helps to improve walking speed and walking endurance among ambulatory stroke survivors.<sup>[7]</sup> Arm-robot therapy and mirror therapy have shown to reduce motor deficits and enhance arm function.<sup>[4],[5]</sup> Thus, availability of multidisciplinary specialized stroke services, knowledge about effective rehabilitation therapies (evidence), by apply those all in clinical practice of stroke related disability can effectively be reduced among stroke survivors world-widely.

### **EVIDENCE-BASED STROKE REHABILITATION**

Knowledge management is an issue for best clinical practice. The number of published clinical research (clinical trials) directly applicable to clinical practice is rapidly expanding making it more and more difficult, if not impossible for the individual health care professional to keep up-to-date with the existing evidence. Systematic reviews can help to provide a balanced, valid, and mostly up-to-date picture of the available external evidence. By give a valuable orientation for some topics that are not available for many others. By providing a picture of the evidence, from making explicit clinical practice recommendations leaving the reader with a degree of uncertainty how to apply the knowledge. Evidence-based clinical practice guidelines are meant to provide this guidance. If they are comprehensive, covering a broad range of topics in stroke rehabilitation and are evidence based they are both valid and clinically useful.

### **OBSTACLES**

In many countries health care structures for stroke rehabilitation are not available. Stroke service team consist of an specialist doctors and nurses various therapeutic professions such as physiotherapy, occupational therapy, speech and language therapy, (neuron) psychology, professionals (core set) were not available. The availability of physiotherapist in high-income countries is more than 900 per 1 million inhabitants. The occupational therapists are more than 400 per 1 million inhabitants in high income countries and there are basically very less speech and language therapists available in low income countries while high-income countries such as USA or Australia have more than 300 per 1 million.<sup>[8]</sup> Lack of resources is prevailing in many other countries to a varying extent.<sup>[8]</sup>



**Figure 1: Stroke rehabilitation—clinical trial publications.** The figure shows the number of clinical trials reports per year as listed by Pub Med.

#### **GUIDELINES FOR STROKE REHABILITATION: OBJECTIVE**

It is a review of systematic search from an appraisal of stroke rehabilitation guidelines was performed. The objectives were to document the guidelines, to distinguish between guidelines that were general stroke guidelines with a rehabilitation section, a genuine guideline that addresses a specific topic within stroke rehabilitation (e.g., mobility), or a guideline that focuses on a specific profession involved in stroke rehabilitation (such as physiotherapy), to classify them as consensus-based (consensus process within guideline development group) and/or evidence based (systematic search and critical appraisal of the literature), as national or international (based on their primary intention and target user group), documents and date. Based on the retrieved Guidelines considered which are published within the last 10 years (year of publication 2009 to 2018), older guidelines were no longer considered relevant for clinical practice.

#### **SYSTEMATIC SEARCH AND SELECTION OF GUIDELINES**

A search for stroke rehabilitation and practice guidelines was performed in three electronic databases, i.e., pub med ([https:// www.ncbi.nlm.nih.gov/pubmed](https://www.ncbi.nlm.nih.gov/pubmed)), askdoris ([www.askdoris.org](http://www.askdoris.org)), and Guideline International Network ([www.g-i-n.net](http://www.g-i-n.net)). A hand search based on the material retrieved (e.g., references) amended for the search process.

#### **RESULTS**

There are 49 publications (three of them were obtained by hand search) remained after removal of duplicates. Of those, 31 of them were excluded for the following

reasons : guideline Published before 2009<sup>[1]</sup>; not disease related (general exercise standards, critical care patients)<sup>[2]</sup>; addressing other or various diseases (chronic heart failure, dyslipidaemia), not specifically stroke<sup>[5]</sup>; for disease prevention<sup>[7]</sup>; acute care (primary stroke center, telestroke centers, atrial fibrillation, intracerebral hemorrhage management<sup>[2]</sup>, subarachnoid hemorrhage management<sup>[7]</sup>); covering other specific aspects of stroke management (organization of services, transition between health care segments etc.)<sup>[4]</sup>; registry recommendation<sup>[1]</sup>; guideline for research.<sup>[2]</sup> Eighteen guideline or practice recommendation publications were selected their characteristics are presented in.

**Table 1: Characteristics of guidelines and practice recommendations related to stroke rehabilitation.**

Author	Geography	Date	Language	General (including rehabilitation)	Rehabilitation	Topic	Profession	Consensus	Evidence
RCP <sup>[9]</sup>	U.K	2016	English	+				+	+
SASS <sup>[10,11]</sup>	South Africa	2010, 2011	English	+				+	
SF (AUS) <sup>[12]</sup>	Australia	2017	English	+				+	+
AHA/ASA <sup>[13]</sup>	U.S.A	2016	English		+			+	+
CSBPR <sup>[14]</sup>	Canada	2016	English		+			+	+
NCGC <sup>[15]</sup>	U.K	2013	English		+			+	+
SIGN <sup>[16]</sup>	Scotland	2010	English		+			+	+
VA/ DoD <sup>[17]</sup>	U.S.A	2010	English		+			+	+
ABMFR	Brasilia	2012	Portuguese			+(motor)			+
HAS	France	2012	French			+(motor)		+	+
DGNR <sup>[18]</sup>	Germany	2009	German			+(Arm paresis)		+	+
DGNR <sup>[19]</sup>	Germany	2015	German			+(mobility)		+	+
AHA/ASA <sup>[20]</sup>	U.S.A	2014	English			+(physical activity)		+	+
AHA/ASA <sup>[21,22]</sup>	U.S.A	2009	English			+(telemedicine)		+	+
KNGF <sup>[23]</sup>	NL	2014	English, Netherlands				+(PT)	+	+
AOTA <sup>[24]</sup>	U.S.A	2015	English				+(OT)	+	+

## SUMMARY AND DISCUSSION

Stroke care guidelines have the advantage that rehabilitation recommendations are linked to the overall stroke management from the acute care to long-term support.<sup>[9-12]</sup> The Royal College of Physicians (RCP) guideline<sup>[9]</sup> makes explicit statements regarding both organizational aspects, specific treatment aspects (focus on ADL, arm function, mobility cognition, communication, and other aspects). The Australian guideline for stroke management<sup>[10]</sup> is similarly broad in scope. When it comes to rehabilitation, a specific recommendations for interventions targeting impairments (sensorimotor, communication and cognitive) activities and managing complications addresses secondary impairments or complications (i.e., impairments that result from the primary impairments). Aspects of care related to participation and reintegration into the community, including self-management, community participation and long-term care are provided. Only one of the 8 general stroke or stroke rehabilitation guidelines<sup>[9-17]</sup> were followed in low- or middle-income countries.<sup>[10,11]</sup> All the other guidelines from the high-income countries cannot easily be applied in a situation like in low income countries where there is little specialized stroke health care in rural parts of the country. National guidelines that primarily focus on stroke rehabilitation<sup>[13,17]</sup> can equally provide comprehensive guidance on both organization and content issues relevant for stroke rehabilitation, and they also provide answers that are adjusted to the regional health care system. As an example, the U.S. stroke rehabilitation guideline<sup>[13]</sup> explicitly takes the situation into account where immediately after a short acute care treatment intensive rehabilitation care is provided in inpatient rehabilitation facilities (IRFS), followed by

skilled nursing facilities (SNFS), that provide “sub acute” rehabilitation, yet without daily supervision by a physician, and other care structures available in the U.S. Therefore, the content of these guidelines has restricted validity outside their context, especially when health care system and organizational aspects are addressed.

Rehabilitation guidelines of stroke are structured based on clinical conditions. The recommendation Offered for people was repetitive task training after stroke on a range of tasks required for upper limb weakness (such as reaching, grasping, pointing, moving, and manipulating objects in functional tasks). Repetitive task training resulted in modest improvement across a range of lower limb outcome measures, but not upper limb outcome measures. While the clinical question approach can certainly be useful, it carries a risk For lack of scope, e.g., not simultaneously looking at the diverse other forms of arm rehabilitation therapies, and to skip relevant (and more effective) treatment options. Indeed, another stroke rehabilitation guideline from the U.K.<sup>[16]</sup> that more comprehensively looked into arm rehabilitation techniques came to a different conclusion and recommended with the highest level (A) Repetitive task training is not routinely recommended for improving upper limb function. An observation made with the general stroke and stroke rehabilitation guidelines is that the evidence integrated in the guideline development process varies considerably and is frequently limited. As an example of those guidelines list from references for their arm rehabilitation recommendations while more than 400 RCTS and more than 100 systematic reviews (SRS) were published for arm rehabilitation post stroke until mid of 2017. With thematically more focused guidelines addressing a function<sup>[18,19]</sup> or a profession<sup>[25,26]</sup>

in stroke rehabilitation. Thereby, the chance to promote recommendations that reflect the best available external evidence at the time of their development is increased. Their development can, however, consume a lot of resources. An inherent problem was that it is difficult to provide the resources for their development and to keep them update day-to-day. Further, it would be economically difficult to reproduce the work for such an intensive evidence-based guideline development in each country. And therefore, the guideline developers on the most relevant SRS is a valid pragmatic approach, but does as illustrated above imply risk of bias by evidence selection.

### **BEST EVIDENCE TO PRACTICE RECOMMENDATIONS AND CLINICAL PATHWAYS**

Guideline and pathway developers might provide beneficial sources that bridge comprehensive up-to-date external evidence with clinical practice recommendations, still needs to be structurally solved in the future. The SIG Clinical Pathways of the World Federation for neuro rehabilitation (WFNR) is currently developing and such an approach for domains where systematic reviews based on RCTS are available.<sup>[28]</sup> The concept is to comprehensively search for systematic reviews addressing therapeutic effects for a given clinical problem (e.g., any intervention for post stroke cognitive impairment), select the most informative and valid up-to-date systematic reviews for critical appraisal and data extraction with an outcome-centered approach, followed by a structural multi-step wise approach to practice recommendations. This approach avoids potential pitfalls of narrowness of health care questions, reduces workload for critical appraisal by selecting the most relevant systematic reviews and does not end with the presentation of evidence (as systematic reviews do), but explicitly links the evidence to practice recommendations in a systematic transparent way. Such scientific information could then easily be adopted as reference by guideline developers worldwide. "Central" guidance might also be warranted for domains where the evidence is limited to (mainly) observational studies and the generation of a methodologically and clinically valid link between evidence and clinical practice recommendation is challenging.

Stroke care in accordance with evidence-based stroke rehabilitation guidelines is effective and can reduce the burden of stroke-related disabilities. Yet, in most countries national evidence-based stroke rehabilitation guidelines are not available and, as stated above the usefulness of guidelines developed in high-income countries is limited for low- and middle-income countries. In that situation, international stroke rehabilitation guidelines would be helpful for a broader readership if they were not only applicable to a specific regional setting, but could provide guidance for professionals from diverse health care system backgrounds. One way to achieve that goal is when

guidelines address the health care questions for stroke rehabilitation in a generic way, independent of organizational and resource settings, i.e., based on stroke sequelae in terms of impairments and activity limitations. If they provided the best available external evidence and hence evidence-based recommendations for treatment of main functional stroke sequel such as arm dysfunction, dysphasia, mobility deficits, perceptual, communication, cognitive, behavioral and emotional disorders they could provide guidance for effective stroke rehabilitation without being bound to organizational pre-requisites. Such guidance does not solve the resource problem, but does nevertheless help to make best use of the resources available. In addition, it can promote the development of regional organizational settings and resources in a way that best supports effective stroke rehabilitation. Regional or local clinical pathways for stroke rehabilitation could make use of these international practice recommendations and implement them in a way that is achievable in the local situation. With high level consensus- and evidence-based recommendations being provided centrally all that remains to be done at a local level is to build contextualized clinical pathways, their communication, implementation, evaluation, and adjustment. These more confined goals might be easier to achieve and in addition the solutions more meaningful by their suggested contextualization, especially for low- or middle income countries. In that way, international stroke rehabilitation guidelines could generate a broad impact without the need for each country to invest time and effort to generate their own evidence-based guidelines. Such international stroke rehabilitation guidelines are currently developed by the WFNR and are intended to be published open-access. The work will also support the WHO initiative "Rehabilitation 2030" and its working group that identifies evidence-based rehabilitation interventions suitable for implementation in low and middle income countries with stroke being a prioritized area.<sup>[29]</sup>

### **CONCLUSIONS**

People around the globe can make use of the guidance that is available from existing stroke guidelines, both in terms of service set-up and organization as well as on how to therapeutically address specific problem that people are faced with after stroke. Two strategies have been adopted, the generation of general stroke or stroke rehabilitation guidelines<sup>[9-17]</sup> with a risk of bias by evidence selection, and a more focal approach<sup>[18-26]</sup> with a higher chance of complete evidence coverage, yet restricted thematic scope and difficulties to keep them up-to-date. Hence, the international community of guideline developers could benefit from a centrally available source of evidence synthesis (that goes beyond SRS) with an explicit link to practice recommendations. Further, a characteristic of the available guidelines is their national focus and their representation of health care situations in high-income countries. Accordingly, they are of limited applicability in other, especially low- and middle income countries.

Since the development of guidelines for each country is not a realistic scenario while the adherence to evidence-based stroke rehabilitation guidelines is likely to reduce the burden of stroke related disability in societies, a pragmatic solution could be to develop international stroke rehabilitation guidelines. These could then regionally or locally be used to both generate contextualized stroke rehabilitation pathways based on the resources locally available and to develop the organization of health care and related resources in a way that will eventually promote effective stroke rehabilitation. That being achieved any benefit for stroke survivors could further be enhanced by additional implementation strategies such as education and print material for both professionals and stroke survivors.<sup>[30]</sup>

#### ACKNOWLEDGMENT

We acknowledged to Vijaya institute of pharmaceutical sciences for women for support and valuable guidance.

#### CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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