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Gandhi, Dorcas BC, Kamalakannan, Sureshkumar, Urimubenshi, Gerard, Sebastian, Ivy A, Montanaro, Vinicius VA, Chawla, Nistara S, D'souza, Jennifer V, Ngeh, Etienne, Mahmood, Amreen , Demers, Marika, Hombali, Aditi, Solomon, John and GCSR Collaborators (2024) Stroke rehabilitation clinical practice guidelines in Low and Middle Income Countries: a systematic review of quality & unique features. *Cerebrovascular Diseases*. ISSN 1015-9770

**DOI:** <https://doi.org/10.1159/000539999>

**Publisher:** Karger Publishers

**Version:** Accepted Version

**Downloaded from:** <https://e-space.mmu.ac.uk/635315/>

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**Additional Information:** This is an open access article which first appeared in *Cerebrovascular Diseases*, published by Karger

**Data Access Statement:** All data generated or analysed during this study are included in this article and its supplementary material files. Further enquiries can be directed to the corresponding author.

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## Cerebrovascular Diseases

Cerebrovasc Dis , DOI: 10.1159/000539999

Received: March 28, 2024

Accepted: June 12, 2024

Published online: August 2, 2024

### **Stroke rehabilitation clinical practice guidelines in Low and Middle Income Countries- A systematic review of Quality & unique features**

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ISSN: 1015-9770 (Print), eISSN: 1421-9786 (Online)

<https://www.karger.com/CED>

Cerebrovascular Diseases

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## **Systematic Review**

### **Stroke rehabilitation clinical practice guidelines in Low and Middle Income Countries- A systematic review of Quality & unique features**

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Short Title: Stroke rehabilitation guidelines in low-and-middle-income-countries

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Keywords: Stroke Rehabilitation; contextualization, evidence based practice, Quality assessment.

Word Count: 4039

## Abstract

### Introduction:

Efforts towards reducing stroke burden have been an immense challenge. One important reasons could be the scope and quality of clinical practice guidelines (CPGs) developed for stroke rehabilitation in Low-and-Middle-Income-Countries (LMICs), restricting its translation to clinical practice. This systematic review aimed to assess the availability, scope and quality of CPGs for stroke rehabilitation in LMICs.

### Methods:

Following PRISMA guidelines, CPGs for stroke rehabilitation in LMICs were searched across four major electronic databases (Medline, EMBASE, CINAHL and PEDro). Additional studies were identified from grey literature and a hand search of key bibliographies and search engines. The availability and content of the CPGs were narratively summarized and quality of de novo CPGs was analyzed using 'Appraisal of Guidelines REsearch and Evaluation' (AGREE) tools: version II & Recommendations Excellence (REX) version. . Features of contextualizations/adaptations of non-denovo CPGs were narratively summarized.

### Results:

Twelve CPGs from 10 countries were included. CPGs from Pakistan, Sri Lanka, India, and China were developed de novo. CPGs from Kenya, Philippines, South Africa, Cameroon, Mongolia, and Ukraine were contextualized/adapted based on existing guidelines from high-income-countries. Most contextualized CPGs had limited stakeholder involvement, local health systems/patient pathway analyses. All ten countries included recommendations for physiotherapy, seven for communication, swallowing, and five for occupational therapy services post-stroke. Quality assessment using AGREE-REX and AGREE-II for de novo guidelines was poor, especially scoring low in development & applicability.

### Conclusion:

Contextualized CPGs for stroke rehabilitation in LMICs were scarcely available and not meeting required quality. There is a need for development of context-specific, culturally-relevant CPGs for stroke rehabilitation in LMICs to improve implementation/translation into clinical practice.

## Introduction

Stroke has been the leading cause of death and disability globally for the past four decades.<sup>1</sup> Much of the stroke-related disability-adjusted life years (DALYs) have been contributed by Low-and-Middle-income Countries (LMICs).<sup>[1]</sup> The burden of stroke rehabilitation is huge globally with about 86 million people affected by it and experiencing 18 million Years Lived with Disability (YLD).<sup>[2]</sup> This burden is compounded in LMICs due to the wide differences in the quality of stroke rehabilitation, with chasms identified in the knowledge and skills of rehabilitation professionals, evidence-based resources available for rehabilitation, and the components of stroke rehabilitation available at various service tiers.<sup>[3], [4]</sup>

To address this growing public health problem, evidence-based interventions for stroke rehabilitation from High-income countries (HICs) have largely been translated and recommended for LMICs.<sup>[5]</sup> However, given the dissimilar context and context-specific challenges and resources, it may not be feasible to effectively translate evidence-based guidelines into practice in LMICs.<sup>[6]</sup> The World Stroke Organization – Lancet Neurology Commission, Stroke Collaboration Group has recently proposed pragmatic solutions for the implementation of evidence-based interventions.<sup>[7]</sup> This aims to reduce the global stroke burden based on the findings of a worldwide qualitative study that identified barriers and facilitators to surveillance systems, stroke prevention, acute care, and rehabilitation.<sup>[8]</sup> The commission identified a paucity of guidance on stroke rehabilitation in LMICs, particularly in the form of evidenced guidelines or Clinical Practice Guidelines (CPGs).<sup>[7]</sup> This is corroborated by poor quality, unavailability, cultural and regional unsuitability, non-specificity, and low evidence of recommendations in CPGs from LMICs. <sup>[8], [9]</sup> Additionally it has been reported that in contrast to HIC CPGs, LMIC CPGs focus more on the organizational structure rather than the actual content of rehabilitation sessions. Ideal rehabilitation sessions as backed by evidence are rarely implementable in LMICs, take for example the NICE CPG recommendation of minimum 3 hours of therapy per day in contrast to the average 17 hours of therapy over a month achieved by the ATTEND trial in India. Similarly the recommendation of minimum 2 hours of active constraint induced movement therapy per day is far from reality in LMICs. <sup>[10], [11]</sup> This is further compounded differences in available workforce, rehabilitation resources, policies and payment methods in HICs and LMICs. <sup>[12]</sup> The use of relevant CPGs could aid in addressing such implementation gaps in stroke rehabilitation, particularly in LMICs. However, the quality and content of stroke rehab CPGs from LMICs are not well characterised or reported, in addition to not being led or endorsed by recognised government or national agencies.<sup>[8],[13]</sup> With the sociocultural uniqueness of various LMICs, it becomes imperative to evaluate existing CPGs for their quality and relevance to local contexts.<sup>[14],[15]</sup> Hence, we systematically reviewed the availability of CPGs for stroke rehabilitation developed by and contextualised for LMICs, evaluated the quality of such CPGs using Appraisal of Guidelines for Research & Evaluation- II (AGREE-II)<sup>[16]</sup> and Appraisal of Guidelines for Research & Evaluation- Recommendation Excellence (AGREE-REX) instruments.<sup>[17]</sup>

The primary objective of this systematic review was to assess the availability, scope, and quality of clinical practice guidelines for stroke rehabilitation in LMICs.

## Methods

**Design:** This review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA guidelines) for systematic review. <sup>[18]</sup> The protocol of this review was registered in PROSPERO (CRD42022382486). The detailed methodology is described in our protocol paper. <sup>[19]</sup> Literature searches were developed and conducted by AH & AM. (Supplementary file 1).

### Criteria for considering studies for inclusion:

Articles were included if they were CPGs for stroke rehabilitation, developed or contextualized for stroke rehabilitation in LMICs. The list of LMICs was based on the World-Bank's classification. We included articles/CPGs published between January 2000 and July 2022. Both empirical and non-empirical studies were included. CPGs only available through purchase and CPGs without information on rehabilitation were excluded.

### Searching electronic and non-electronic databases:

The search terms were conceptualised and developed using MeSH terms 'stroke', 'rehabilitation' and 'clinical practice guidelines' were used as keywords. The search was run in four electronic databases namely Medline, EMBASE, CINAHL and PEDro. AH and AM ran the searches in August 2022. The search was focused on published CPGs for stroke rehabilitation in LMICs between January 2000 and July 2022. SK and DG ran the additional searches in SUMSearch, Google, and guideline portals (Guidelines International Network, National Guideline Clearinghouse, BIGG International database of GRADE guidelines, ECRI Guidelines Trust). Additionally, groups involved in stroke rehabilitation CPG production and analysis, websites of stroke associations, health institutes of

national importance, and government websites of LMICs were contacted and requested for CPGs relevant to this review. (For more details, please refer to our protocol paper [19]).

#### Study selection:

We utilized the Rayyan web tool to screen and select articles. Titles and/or abstracts were screened by DG, NSC, PJV, CJF, IS, JD, VM, HS & AP, and potentially eligible full texts were independently reviewed by DG & IS based on predefined selection criteria. We included the most recent versions of CPG developed for use in LMICs for the rehabilitation of individuals with stroke. Where several versions existed, the most recent one was used. In cases of updates to pre-existing CPGs where updates mentioned only new recommendations, the previous version was included as well. In case of disagreement, consensus was reached with a third reviewer (JS).

#### Data extraction:

A customized data extraction form on Microsoft Excel was used, and three independent reviewers (DG, IS & GU) independently extracted data from the included studies on the title of the study, country of origin, characteristics of the study (Scope: national/regional, level of care, multidisciplinary/uni-disciplinary), phase of intervention (Acute, subacute, chronic), rehabilitation setting (in-patient, out-patient, community/home setting), domain of care (Motor, sensory, speech-language, swallowing, cognitive, functional, occupational, physical activity, fatigue, nutrition, etc) and information on stroke rehabilitation relevant recommendations. In addition, levels of evidence for each recommendation were extracted wherever applicable. Information was extracted on the type of CPG from each country, whether it was originally developed for the country or if it was contextualized from another CPG. Overall consistency in data extraction among DG, IS, and GU was reviewed by SK.

#### Assessment of the quality of guidelines

CPGs that were developed de novo, were evaluated on AGREE-II & AGREE-REX instruments.[16], [17] The purpose of AGREE II was to provide a framework to assess the quality of guidelines, provide a methodological strategy for the development of guidelines and to inform how and what information ought to be reported in guidelines. The AGREE II consists of 23 key items organized into six domains followed by two global rating items (Overall Assessment). Each domain captures a unique dimension of guideline quality: Scope and Purpose, Stakeholder Involvement, Rigour of development, Clarity of Presentation, Applicability, and Editorial Independence. Each of the AGREE II items and the two global rating items were rated on a seven-point scale (1– strongly disagree to 7– strongly agree). Domain scores are calculated by summing up all the scores of the individual items in a domain and by scaling the total as a percentage of the maximum possible score for that domain. Similarly, the total score of the instrument is calculated across all domain scores.

The AGREE REX instrument assesses the Clinical credibility, implementability and consideration of values of all relevant stakeholders in the formulation of the recommendations which are represented as three domains of the instrument. Scoring is similar to the AGREE-II instrument. We followed the AGREE instrument manuals accessible at the Agree trust (<https://www.agreetrust.org/>) to appraise the eligible CPGs.

Three independent reviewers (DG, JS & VM) evaluated relevant CPGs on the AGREE instruments. If CPGs were contextualized/adapted from other CPGs, they were deemed unsuitable for scoring on the AGREE instruments. However, information on the various types of processes/frameworks used in contextualization/adaptation and features considered for contextualization/adaptation (cost, implementation & dissemination strategies, patient pathways, co-design, cultural/regional adaptations, health system analysis, alternate recommendations if any), were synthesised and reported.

#### **Results**

A total of 4329 CPGs were retrieved, of which 3990 underwent level 1 screening after removal of duplicates. 69 articles were retrieved for full text screening out of which 12 CPGs were finally included for the review. [20-31] More details about the study selection process are available from the PRISMA flow diagram (shown in Fig. 1). Finally, CPGs were included from ten LMICs. Table 1 provides the detailed characteristics of the included CPGs. CPGs from only four LMICs namely Pakistan, Sri Lanka, China & India were developed de novo.[20], [21], [22], [31] Rest of the six CPGs from Kenya, the Philippines, South Africa, Cameroon, Mongolia & Ukraine and they were contextualized from CPGs available in HICs. [23-27] Of the 12 CPGs, two CPGs were from the Philippines [28-30] one of which was an older contextualization based on which a national guideline was proposed, and the other an updated contextualization published in 2015.

#### Content of the CPGs

Overall, all 10 countries have included recommendations on Physiotherapy, eight countries for Speech-Language as well as swallowing, and five on Occupational therapy. Only two of them have included recommendations related to social worker's support in stroke care (Mongolia, South Africa). Five countries have provided

recommendations for post-stroke cognition (South Africa, Mongolia, Sri Lanka, China & Pakistan) and five on nutritional aspects of rehabilitation (Mongolia, Pakistan, Sri Lanka, Ukraine & India). Most of the countries have reported recommendations covering acute, chronic, and community-based settings except CPGs from Pakistan & Ukraine. Recommendations for motor rehabilitation were an important aspect reported in all the CPGs. Sensory and functional rehabilitation recommendations were covered by nine countries except Pakistan. Physical activity recommendations were reported by five countries (Kenya, South Africa, Mongolia, Sri Lanka & Ukraine). Fatigue management was reported in the recommendation of two countries (South Africa & Mongolia). Details of these are provided in Table 1. Recommendations from included CPGs and their underpinning level of evidence were also synthesised and presented as Supplementary Material 2.

#### Target audience & Stakeholder involvement

Most of the included CPGs identified healthcare practitioners as their primary audience. However, it is important to note that additional target groups outside of healthcare providers were identified only in the CPGs of Mongolia and Cameroon.

A large target audience was catered to by the CPGs in Mongolia [26], including medical professionals, nurses, physiotherapists, public health experts, research assistants, programme administrators, and rehabilitation consultants. This showcases the different healthcare personnel involved in the care and rehabilitation of stroke survivors. Physicians were considered key persons in designing the standards of stroke care in these CPGs. Similarly, in Cameroon, the primary target audience for their CPG were physicians, WHO representatives, and technical rehabilitation officers [25]. This implies that the guidelines were primarily targeted at physicians and physician-scientists specialised in physical medicine and rehabilitation contributing to global healthcare organisations. However, CPGs from Mongolia and Cameroon thus emphasise inclusiveness by acknowledging a variety of professions that are integral to stroke care and rehabilitation in these countries.

Stakeholders involved in the development/contextualization of the included CPGs were a mix of medical doctors (internal medicine, neurologists, physical medicine, and rehabilitation), physiotherapists, and nurses. While some CPGs had a comprehensive stakeholder team including but not limited to administrators, and policymakers in addition to medical doctors, and nurses (Kenya [23], South Africa [24], Cameroon [25]), others had limited representation as they included only Neurologists (Pakistan), Doctors of Physical Medicine and Rehabilitation (Philippines). It is also important to note that only two of the 12 CPGs (Kenya [23] & South Africa [24]) included stroke survivors and caregivers in the guideline development/contextualization process. CPGs from Mongolia [26], India [22], and Ukraine [27] were either approved by or developed by their respective Ministries of Health yet lacked an interdisciplinary approach.

#### Quality assessment of the CPGs by AGREE-II & AGREE-REX

Only four countries (Pakistan [20], Sri Lanka [21], China [31] & India [22]) had developed CPGs exclusively for their countries without contextualising the guidelines from HICs. Therefore, these CPGs were considered for quality assessment using AGREE instruments. In general, all three CPGs scored lower on AGREE-REX than AGREE-II. Considering individual domain scores, the domain of Scope and purpose in AGREE-II scored the most, while the clarity of presentation component followed the second highest score. CPGs scored poorly on Rigor of development & applicability. Due to the lack of information and reporting related to the domain of editorial independence, this component was scored as 0 for all three CPGs (shown in Fig. 2). Similarly, all three CPGs from Sri Lanka, Pakistan and India scored very low on all three domains of AGREE-REX instrument showing poor clinical applicability, implementability and consideration of the values and preferences of users (shown in Fig. 3). Overall, the CPGs from Pakistan scored 6.76% for methodological rigor and 0% for clinical aspects, while CPGs from Sri Lanka scored 4.34% on methodological rigor and 0.6% on clinical aspects and CPGs from India scored 8.45 and 1.23 on methodological rigor and clinical aspects respectively (shown in Fig. 4).

#### Contextualised CPGs

Stroke rehabilitation CPGs from six countries (Kenya [23], Philippines [28-30], South Africa [24], Cameroon [25], Mongolia [26] & Ukraine [27]) were contextualized/adapted from guidelines of HICs and hence were unsuitable for quality assessment using AGREE instruments. The Kenyan CPGs used the Philippine Academy of Rehabilitation Medicine (PARM) framework that assesses the generalizability and applicability of the included recommendations. The Kenyan CPG utilised three guidelines from HICs, particularly from America, Netherlands, and New Zealand for contextualization after quality assessment by AGREE-II and by using the PARM writing guide. A Delphi consensus method was applied to assess, ratify and contextualize the Kenyan CPG for the local context. CPGs from the Philippines [28-30] were contextualized by the PARM using a self-developed 21-step process including training of participants, establishing a framework for contextualization, guideline searching, critiquing,

contextualization, review, and implementation. The Philippines CPG used the CPGs of four HICs namely Canada, Australia, Scotland, and America for contextualization. An updated version of the contextualised CPG was published in 2015 which considered new clinical guidelines via the search of electronic databases and assessed the methodological quality of each with iCAHE: International Centre for Allied Health Evidence Guideline Quality Checklist. Using a novel standard updating approach and with the PARM writing guide, updates to the Philippines CPGs were reported.

The CPG from South Africa [24] was developed based on composite recommendations from 16 CPGs using the Adopt–Contextualise–Adapt (ACA) approach which proposes strategies to bridge local implementation gaps and address implementation barriers. The ACA toolkit is a decision-making guide which allows to generate discussions on endorsement and development of implementation strategies for evidence-based recommendations.

In Cameroon [25], a local multidisciplinary team (MDT) developed an eight-stage process for developing local CPGs from CPGs of South Africa, the Philippines, Singapore, and Canada. Recommendations applicable to Cameroon were selected and progressively adapted by multiple rounds of MDT discussions. The final draft guidelines were externally reviewed by experts before reporting the ‘Best Practice Guidelines for the Management and Rehabilitation of Stroke in the Northwest Region of Cameroon.

CPGs from Mongolia [26], presented by the country’s Ministry of Health were based on the CPGs from Scotland, Australia, the UK, and America. However, the process of contextualization was not reported in the document.

Lastly, CPG from Ukraine, presented by their Ministry of Health were based on the CPGs from the UK, Canada, Scotland, and Europe with no details about the method of contextualization.

#### Features of Contextualization

We also gathered information on various aspects considered by each country to contextualize CPGs for their settings. Data on cost, patient pathways, cultural/regional aspects, implementation and dissemination strategies, and health system implications were extracted and are presented in Table 2. An overview of the various recommendations provided by the 12 included CPGs and their levels of evidence are also provided as a Supplementary File-2. Except for the Indian and Ukrainian CPGs, the rest used similar grading for the level of recommendation as stated in the table.

#### **Discussion**

Our review identified various lacunae in the development of CPGs for stroke rehabilitation in LMICs, as reported by Yaria et al (2021), Bernhardt et al (2021), and Mead G et al (2023) previously. There was a lack of systematic and scientific rationale for the CPGs that were developed de novo, which were hardly 4 in number, as well as those contextualised from HICs. Most of the CPGs were incomprehensive with respect to stroke rehabilitation and lack in terms of the multi-disciplinary team approach to stroke care. The CPGs both contextualized as well as developed de novo scored very low in terms of overall quality. Sufficient information about the formulation of the CPG recommendations was lacking in most of them. The relationship between CPG recommendations and supporting evidence specific to the context was missing. The authors highlight the fact that the biology of stroke is unchanged in LMICs when compared to HICs, this would not mean the need to generate new evidence for LMICs rather, develop contextual and implementation strategies to help deliver the existing evidence in LMICs in the best possible way. Authors report that stakeholder engagement for the development of these CPGs was limited and did not include all relevant stakeholders. Alternate recommendations that allow for better implementation of evidence where the primary recommendation cannot be implemented were also severely lacking.

#### Novelty & Significance

All the CPGs scored nil for clinical implementability and credibility on the AGREE\_REX scores. Most CPGs identified in this review appear to be developed from a medical model of rehabilitation and do not include implementable strategies that are specific to context of stroke rehabilitation in LMICs.[32] There is a clear need for systematically developed context-specific, culturally relevant stroke rehabilitation CPGs in LMICs which can aid in bridging these gaps when accompanied by comprehensive implementation plans and rigorous dissemination strategies.[33-36] The recent review by World Stroke Organization (WSO) identified CPGs for stroke in LMICs. However, the rehabilitation component of these CPGs lacked description or details particularly those from LMICs. [9] Majority of the CPGs identified in this review were contextualized from those developed for HICs. We believe that for once, in the absence of alternatives, such contextualization/adaptation for LMIC settings is crucial, until local evidence emerges. [37] However, contextualising CPGs from HICs must not be considered as a final solution to addressing the burden of stroke rehabilitation in LMICs.[36] Contextualization/adaptation however is a skilful process that includes but is not limited to mapping CPGs to local clinical pathways. It is absolutely critical to assess



regional barriers to implementation of CPGs and to develop implementable strategies to address these context-specific barriers.[38] One must certainly approach the development of CPGs from a health systems perspective, particularly considering rehabilitation policies, workforce, governance structure, systems for capacity building, and rehabilitation information management.[24],[28] Importantly, the culture, health literacy, and needs of the affected population in these contexts must never be ignored.[39] Table 2 describes a few aspects that any CPG contextualization process should consider for effective and meaningful outcomes for implementation in varied contexts. It is important to remember that where contextualization is unsuitable, there are other alternatives where recommendations can be directly applied from one setting to another (Adoption) or may need additional new evidence before implementation locally (Adaptation). The Adoption-Contextualization-Adaptation (ACA) model is well described by Grimmer K et al. This could be a potential as well as a feasible way for developing regionally specific CPGs in LMICs. [24]

Another important aspect to consider is investing in stroke care in LMICs. There is a need to ensure financial allocation and implementation of stroke care at any cost in LMICs. Although most of these LMICs have a policy for stroke care, the premise of these policies is driven through a medical model and therefore the rehabilitation and social care components of stroke care are neglected from the current programs and policies for stroke care in these settings.[40] The medical model for stakeholder engagement and development of these CPGs in LMICs highlights a non-inclusive, narrowed approach to stroke care in addition to lack of a functional international or national guideline development group focusing on LMICs, such as the Scottish Intercollegiate Guideline Network (SIGN) 29 or the Australian National Health and Medical Research Council (NHMRC) references.[41] The world disability report very clearly describes the absence of an integrated comprehensive bio-psychosocial approach to the development of any interventions, including CPGs for people with disabilities in general. There is a need to invest in stroke rehabilitation with such an approach and strengthen rehabilitation within the health systems in LMICs.[42], [43] The World Health Organization (WHO) provides a Package of Interventions for rehabilitation (PIR) for stroke to assist countries in planning, budgeting and inclusion of rehabilitation into their health systems. The PIR provides clear information on essential interventions with relevant human and infrastructural resources required for smooth delivery across service delivery levels. [44] Similarly the WSO-Lancet Neurology Commission has provided pragmatic solutions to improve stroke rehabilitation and has highlighted the need for context-specific therapy protocols and guidelines. This recommendation was in addition to creation and investment in multidisciplinary rehabilitation intervention, use of recommended assessment tools and training of rehabilitation professionals. [7] The 'Intersectoral Global Action Plan on Epilepsy and Other Neurological Disorders 2022–2031', also enforces the need for multidisciplinary rehabilitation and strengthening existing services, guidance & protocols of therapy. [45] Subsequently, Organizations like the International Stroke Rehabilitation and Recovery Alliance (ISRR) and WSO have been proactively demystifying the absence of focus and participation of experts (including experts by experience) in stroke care from LMICs in any international initiatives for stroke care. [46] The last important aspect that we intend to discuss is the incorporation of experts from experience in the conceptualisation, development, and implementation of the CPGs in LMICs. The well-developed Living guidelines for stroke rehab in Australia have the added merit of having included persons with lived experience and their lived experience in the development phase. The team was funded by the Australian government's Medical Research Future Fund and is updated periodically. [10] This approach allows for patient voices and concerns to be heard, and their experiences to be incorporated while creating evidence-based recommendations, making CPGs more relevant to users. In our review, the CPG from South Africa was the only CPG that used co-design as a component during its development. Co-design also allows for consideration of appropriate local context factors that may influence the uptake of CPGs. The option to update them as new evidence emerges allows for the CPGs to be relevant to contemporary clinical practice. Therefore, the development of any CPGs must engage those with lived experience of a stroke and co-design their interventions for stroke care in LMICs.

### Implications

Context-specific, inclusive development and implementation of CPGs for stroke care have been proven successful in many HICs. Transforming recommendations regionally into clinical pathways that reflect the local healthcare systems is essential. [47--50] This was emphasized by many stroke CPG development consortiums. [51]. The content of the CPGs must be evidence-based and relevant to the context. Future studies should aim to develop localized clinical protocols with targeted aims for various domains of rehabilitation from available global evidence and integrate it with the contextual evidence to fit its purpose.[10,46] Subsequently, implementation research on the established clinical recommendations from HICs can be conducted in LMICs to test the effectiveness of such approaches when optimised for local settings. [51]

### Limitations

The authors acknowledge few limitations of this review. First was the exclusion of CPGs that were not published in English. It is possible that this language restriction resulted in the exclusion of useful guidelines that were written in languages other than the ones that were supported. However, there was only one CPG (from El Salvador retrieved from CPGs reported by guideline groups) excluded exclusively due to being published in a language other than English. Similarly, although the exclusion criteria mentioned those CPGs that were paid, we did not have to exclude any due to this reason.

### **CONCLUSION**

This systematic review provides a comprehensive overview of the existing CPGs for stroke rehabilitation in LMICs. This review provides both the scope and the quality of the CPGs for stroke rehabilitation in LMICs. The use of standardised tools such as AGREE II and REX measure quality has been invaluable in gaining insights into the relevance and implementability of the existing CPGs. Similarly, the synthesis of contextual and health system issues that affect the CPGs in this review provides immense knowledge on factors for the effective implementation of the CPGs in LMICs.

Contextualised clinical practice guidelines for stroke rehabilitation were hardly available and of good quality in LMICs. Guidelines from HICs must be thoroughly evaluated before translating to these contexts. There is an immense need for the development of context-specific, culturally relevant clinical practice guidelines for stroke rehabilitation in LMICs.

### **Statements**

**Acknowledgment** We acknowledge the members of the Global Consortium of Stroke Rehabilitation listed here: Jeyaraj D Pandian, Rinia Mascarenhas, Abhilash Patra, Pranay J Vijayanad, Sania Zareen, Ranjit Injety, Dimple Dawar, Khim Li Kwah, Olumide Dada, Sandeep Subramaniam, Guilherme Affeldt, Gillian Mead, Julie Bernhardt and Coralie English

### **Statement of Ethics**

**Study approval statement:** A statement of Ethics is not applicable because this study is based exclusively on published literature.

**Consent to participate statement:** Not applicable because this study is based exclusively on published literature.

**Conflict of Interest Statement:** The authors have no conflicts of interest to declare.

**Funding Sources** This study was not supported by any sponsor or funder.

**Statement of Ethics:** A Statement of Ethics is not applicable because this study is based exclusively on published literature.

### **Author Contributions**

DBCG, SK, JS, VM and GU contributed to the conception of the work. DG, SK, VM, NSC, JVD, AM, AH and IAS contributed to data extraction and analysis. DG, SK, GU, and JVD contributed to data interpretation and quality analysis. DG, SK, JVD, NSC, EN, and MD led manuscript writing and editing while DG, JS & SK contributed to the final approval of the manuscript.

**Data Availability Statement** All data generated or analysed during this study are included in this article and its supplementary material files. Further enquiries can be directed to the corresponding author.

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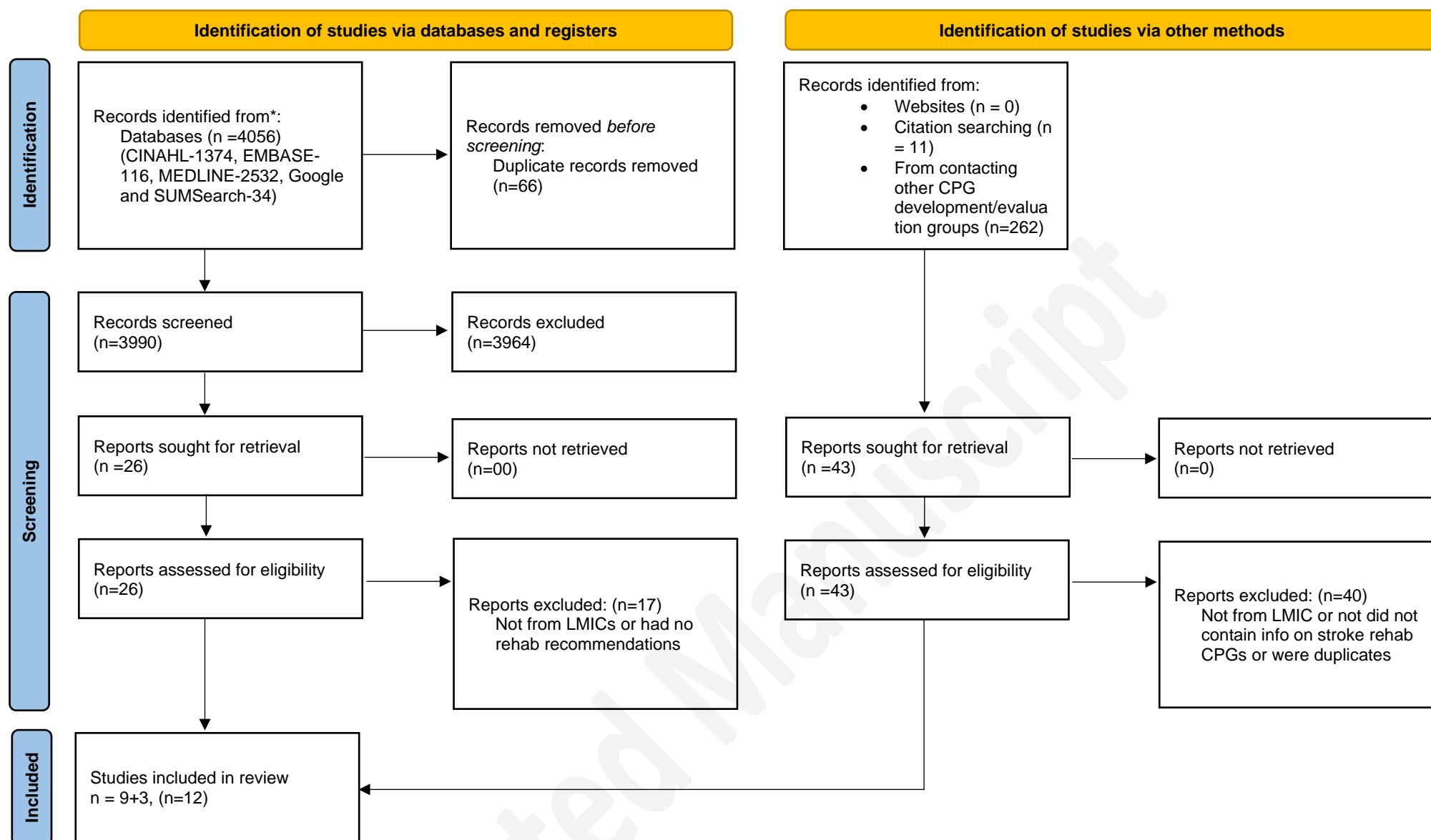
### Figure Legends

Fig. 1. PRISMA flowchart

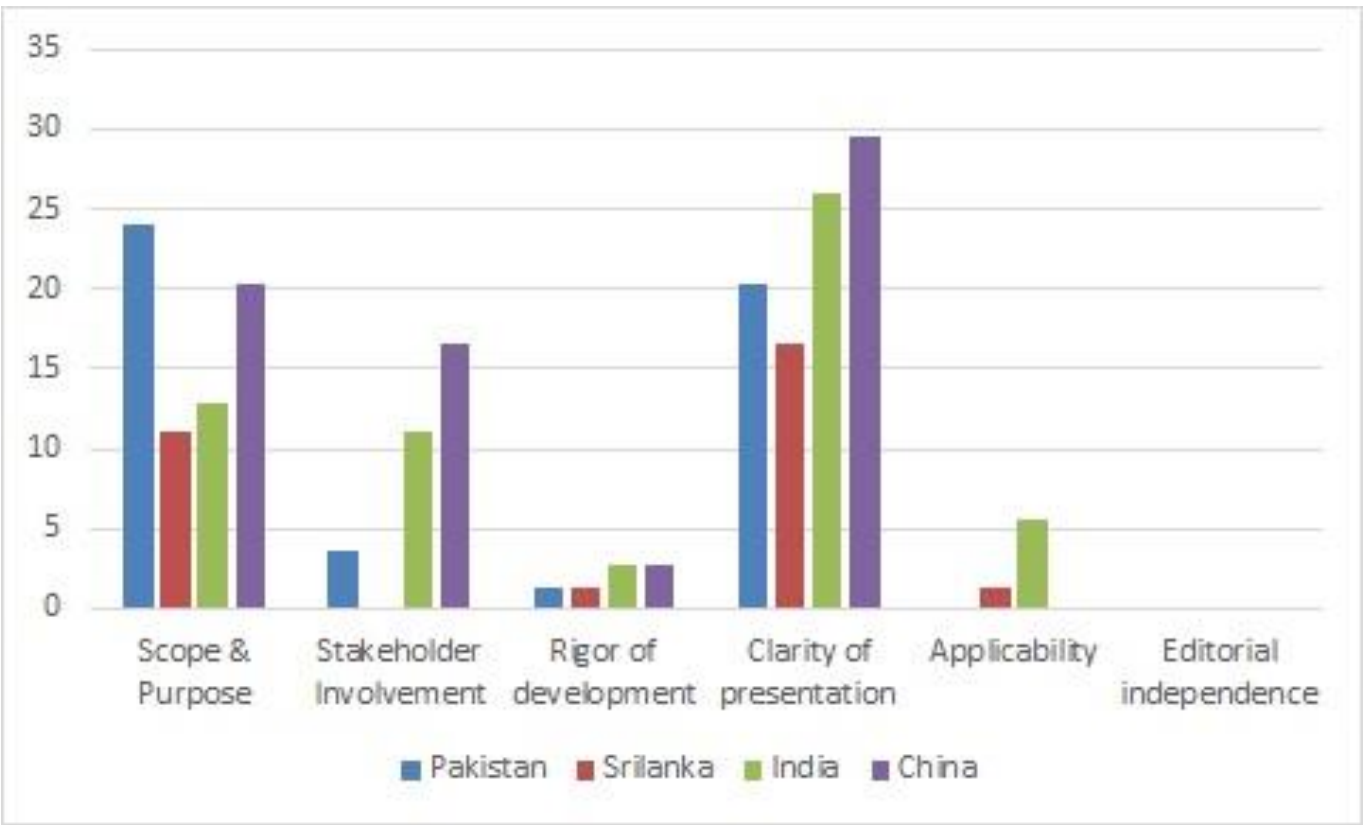
Fig. 2. Mean scores of Percentages of individual domains of AGREE-II of the CPGs developed De novo

Fig. 3. Percentage of mean scores of individual domains of AGREE-REX

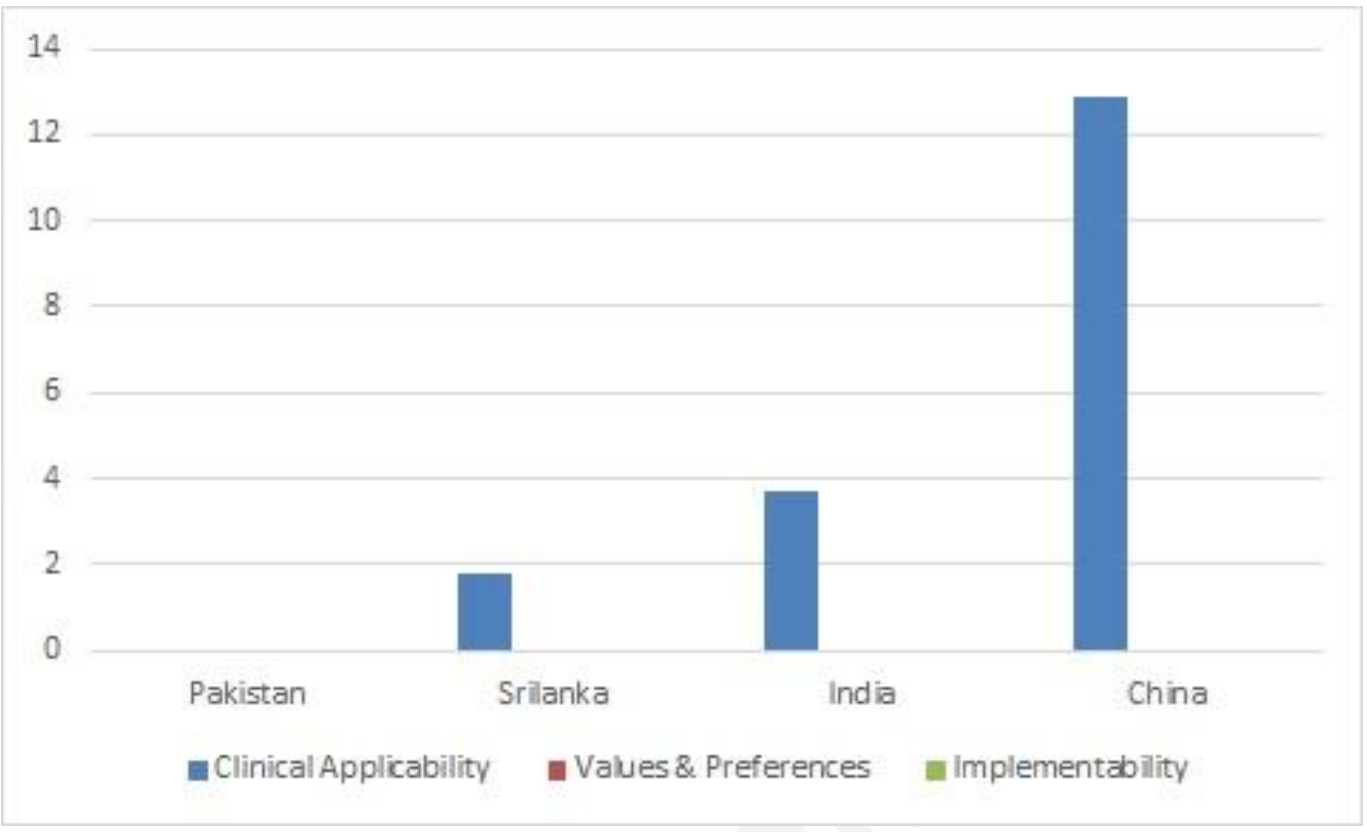
Fig. 4. Percentage of overall mean scores on AGREE-II & AGREE-REX



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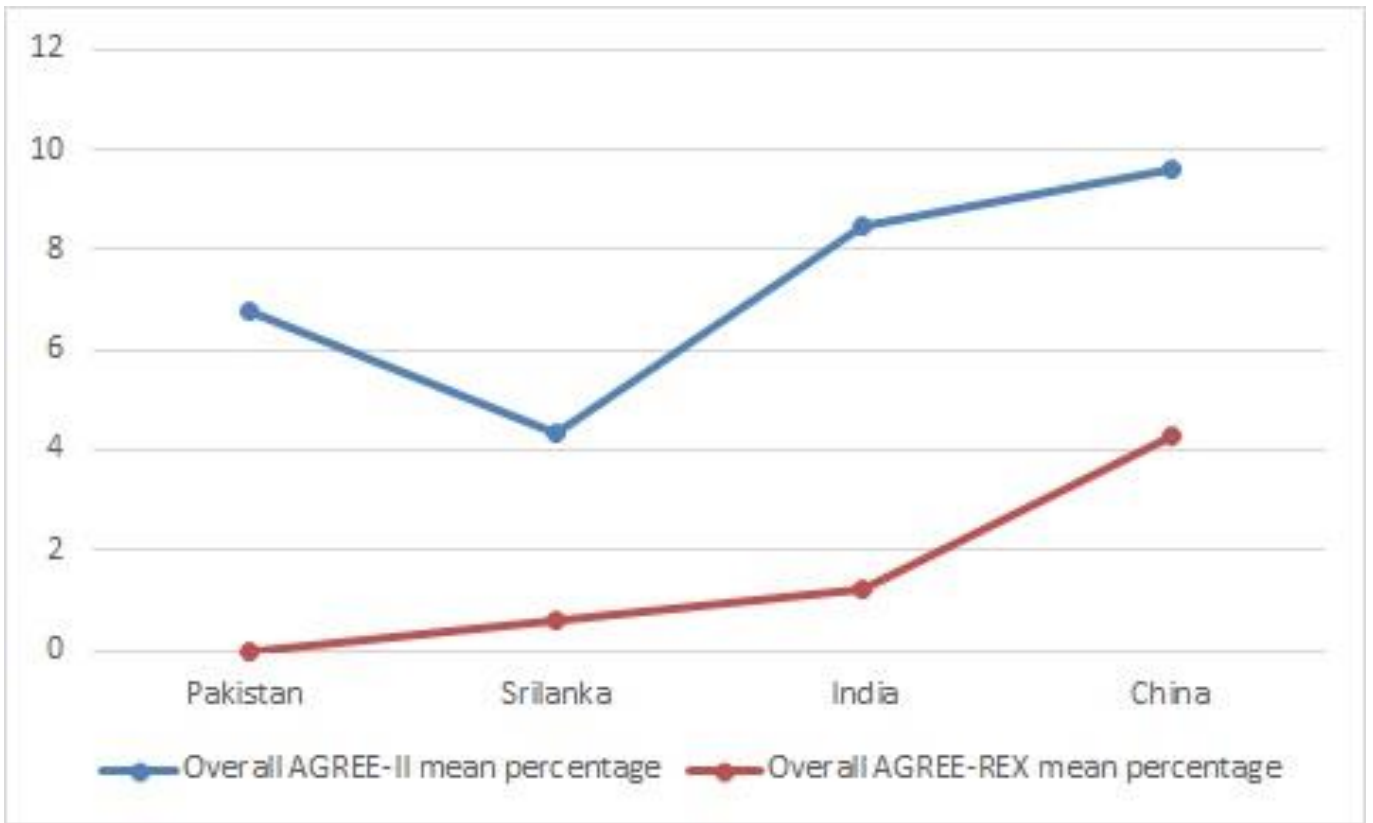


Table 1: Characteristics of the 12 included CPGs 10 LMICs

Sl no	Country	Contextualized/ De novo	Author & year	Contextualization framework/Process	Parent CPG	Disciplines covered	Domains covered
1	Kenya	Contextualized	Kingau NW et al, 2017	PARM framework + AGREE II	America, Netherlands, New Zealand	PT	Motor, Sensory, Functional & Physical Activity
2	Philippines	Contextualized	Gonzalez-Suarez et al, 2012	21 step PARM framework	Canada, Australia, Scotland and America	PT, OT & SLT	Motor & Sensory
		Contextualized	SSP, 2014	-do-			Motor, Sensory, Speech-Swallow
		Contextualized (Update to contextualization)	Gambito EDV et al, 2015	PARM framework	America, Europe, New Zealand, South Africa		
3	South Africa	Contextualized	Grimmer K et al, 2019	ACA approach	16 CPGs from HICs	PT, OT, SLT, C & SW, N	Motor, Sensory, Functional, Occupational, Speech-Swallow, Cog/Psy, Social

							Participation, Physical Activity & Fatigue
4	Cameroon	Contextualized	Cockburn L et al, 2014	Intrinsically developed 8-stage process	South Africa, Philippines, Singapore & Canada	PT, OT & SLT	Motor, Sensory, Functional & Speech-Swallow & Social Participation
5	Mongolia	Contextualized	MoH, 2013	Not mentioned	Scotland, Australia, UK and America	PT, OT, SLT, C, SW & N	Motor, Sensory, Functional, Occupational, Speech-Swallow, Cog/Psy, Social Participation, Physical Activity & Fatigue
6	Pakistan	De novo	Kamal AK et al, 2010	NA	NA	PT & N	Motor, Cog/Psy
7	Sri Lanka	De novo	Gunaratne P et al, MoH, 2015	NA	NA	PT, OT, SLT, C & N	Motor, Sensory, Functional, Occupational, Speech-Swallow, Cog/Psy, Social Participation,

							Physical Activity
8	Ukraine	Contextualized	MoH, 2012	Not mentioned	UK, Canada, Scotland & Europe	PT, SLT, N	Motor, Sensory, Functional, Speech-Swallow, Cog/Psy, Physical Activity
9	India	De novo	MoH, 2019	NA	NA	PT, SLT, N	Motor, Sensory, Functional, Speech-Swallow
10	China	De novo	Chinese Stroke Association	NA	NA	PT & SLT	Motor, Sensory, Functional, Speech-Swallow, Cog/Psy, Social Participation, secondary complication prevention, cardiopulmonary function rehabilitation

Abbreviations: SSP: Stroke Society of Philippines, PARM: Philippine Academy of Rehabilitation Medicine, AGREE: ACA: Adapt-Contextualize-Adopt, MoH: Ministry of Health, PT: Physiotherapy, OT: Occupational therapy, SLT: Speech language therapy, C: Cognitive therapy, SW: Social work, N: Nutrition, Cog/Psy: Cognitive/Psychological, UK: United Kingdom

Table 2: Characteristics of contextualization of the CPGs

Countries	Aspects of contextualization						
	Cost	Patient pathway	Implementation strategies	Dissemination strategies	Cultural/Regional adaptations	Health system analyses: strengths & weaknesses	Alternatives for recommendations
Kenya	Yes	Yes	No	Not specified	Yes	Partially	Yes
Philippines	Unclear	Yes	Yes	Yes	Unclear	Partially	Unclear
South Africa	Unclear	Unclear	Yes	Not specified	Yes	Yes	No
Cameroon	Not specified	Not specified	Yes	Yes	Yes	Unclear	Not specified
Mongolia	Not specified	Not specified	Yes	Not specified	Not specified	Not specified	No
Ukraine	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	No

*Yes: this aspect was considered during contextualization, Unclear: there is some information but unclear as to what was done, Partially: there is some information but unsure as to how and how much was done, Not specified: No information provided*