Physiotherapy practices in acute and sub-acute stroke in a low resource country: A prospective observational study in Benin

Peer-reviewed author version

AMANZONWE, Renaud; KOSSI, Oyene; NOUKPO, Ines; Adoukonou, T; HANSEN, Dominique; Tedesco Triccas, Lisa & FEYS, Peter (2023) Physiotherapy practices in acute and sub-acute stroke in a low resource country: A prospective observational study in Benin. In: Journal of Stroke & Cerebrovascular Diseases, 32 (11) (Art N° 107353).

DOI: 10.1016/j.jstrokecerebrovasdis.2023.107353
Handle: http://hdl.handle.net/1942/43146

Physiotherapy practices in acute and sub-acute stroke in a low resource country: a prospective observational study in Benin

Abstract

Background and objective: Physiotherapy is highly recommended for early recovery from stroke. This study aimed to document physiotherapy practices for people with acute and early sub-acute stroke in Benin.

Methods: In this prospective observational study, physiotherapists working with acute stroke people documented the content of their treatment from six hospitals in Benin during the first session, at 2-week, and 1-month post-stroke with a standardized physiotherapy documentation form. We used the motricity index (MI) and trunk control test (TCT) to assess impairments, and the 10-meter walk test (10mWT), functional independence measure (FIM), walking, stair climbing, and dressing upper body subscales were used for activity limitations.

Results: Fifteen physiotherapists (60% male, mean±SD age=31.3±5.8 years) recorded treatment sessions for 77 stroke participants (53.2% male, mean±SD age=57.7±12.5 years). Physiotherapists focused on conventional physiotherapy approaches, including musculoskeletal (67% of pre-functional activity time) and neuromuscular (53% of sitting activity time) interventions. A significant difference was found between the therapy time delivered for people with mild, moderate, and severe stroke ($p < 0.001$). The MI ($p= 0.033$) and TCT ($p= 0.002$) measures showed significant improvement at 2-week and 1-month ($p< 0.001$) post-stroke, while 10mWT, FIM walking, stair climbing, and dressing upper body items significantly increased at 1-month ($p< 0.001$) but not at 2-week post-stroke.

Conclusion: Physiotherapists working with acute stroke patients in Benin mainly use conventional neuromuscular and musculoskeletal interventions. In contrast, aerobic exercises were rarely employed regardless of stroke severity. Furthermore, our findings showed that the volume of physiotherapy sessions varied by stroke severity.

Keywords: Clinical Practice, Physiotherapy, Stroke**,** Benin

1. Introduction

Stroke remains one of the leading causes of long-term disability worldwide.[1] Low- and middle-income countries (LMICs) bear the heavy burden, with approximately 70% of stroke-related deaths and 87% of stroke-related disabilities.[2,3] Cardiorespiratory deconditioning is common after stroke, negatively impacting functional recovery and participation in normal daily activities and increasing the risk of stroke recurrence and other cardiometabolic diseases.[4–6] From the first week until the first-month post-stroke (acute and early subacute phase), there is a critical time for neural plasticity,[3] and is an important treatment period to maximize the potential of restorative interventions.[8] To address post-stroke deconditioning, the American Heart Association,[9,10] the Canadian Guidelines for Best Practices in Care After Stroke,[11] and the Australian Guidelines[12] for stroke management recommend that aerobic training be a fundamental component of post-stroke rehabilitation. However, the body of literature on stroke rehabilitation reports different approaches to stroke rehabilitation in high-income countries (HICs) vs. LMICs.[13] Rehabilitation in HICs tends to follow recommended stroke rehabilitation guidelines based on evidence-based practice.[14,15] In contrast, in LMICs, rehabilitation depends on the availability of human and material resources and stroke rehabilitation services, which are often limited.[13,16] In addition, in low resource countries like Benin the fact that the majority of citizens are uninsured and have to pay out-of-pocket for all stroke-related services is a major barrier to access to rehabilitation services.[17]

Negrini (2017)[18] reported that many countries are not equipped to respond to current rehabilitation needs. In some low-income countries, including the Republic of Benin, most people with stroke or disabilities do not receive the necessary rehabilitation services.[13] The

benefits of physiotherapy have been reported in stroke survivors in low-income settings,[19] but the content of physiotherapy, i.e., the type and volume of interventions, remains unknown. Documenting current physiotherapy practices in low-income settings will help clinicians and researchers check whether their approaches align with evidence-based practice recommendations for improved functional recovery in people with stroke. Also, at a more detailed level, a taxonomy that details the treatments and therapeutic activities used by physiotherapists provides insight into what occurs in acute stroke rehabilitation programs.[20] In contrast to low-income countries, the physiotherapy interventions for inpatients with stroke were reported by two previous studies in HICs[21,22] using the same rehabilitation treatment taxonomy in stroke rehabilitation[20] as the present study. However, one did not address the physiotherapy interventions by stroke severity,[21] and the other focused on activities[22], not interventions used to facilitate those activities.

The present study aimed to document the current contents of physiotherapy practices within inpatient and outpatient rehabilitation facilities for acute and early subacute stroke in Benin. These insights can contribute to opening the "black box" of physiotherapy content in acute and subacute stroke rehabilitation in Western Africa, particularly in Benin.

2. Methods

2.1 Study design and ethical considerations

The present study is a multicenter prospective observational study involving acute stroke participants and physiotherapists from six hospitals. The study received approval from the ethics committee of the Hasselt University in Belgium (reference: CME2021/050) and the local biomedical ethics committee of the University of Parakou in Benin under the number (0451/CLERB-UP/P/SP/R/SA). Participants agreed to participate by signing a consent form following the Declaration of Helsinki.

2.2 Settings

People with stroke and their physiotherapists were recruited from three reference universities and three departmental hospitals in Benin. Participants with stroke were followed up for one-month post-stroke during their hospitalization or in outpatient and assessed at three-time points: at enrolment (T0), 14 days post-stroke (T1), and 30 days post-stroke (T2).

2.3 Participants

Between June and December 2021, we recruited physiotherapists working with individuals with acute stroke, and they systematically recruited individuals with acute and early subacute stroke. Individuals with stroke were eligible if they (1) were at least 18 years old, (2) were diagnosed with first-ever stroke (enrolled < 14 days from stroke onset), and (3) had motor impairments on admission (Motricity index >1). People poststroke with other neurological diseases (such as Parkinson's disease and Alzheimer's disease) were excluded.

2.4 Procedure

The treating physiotherapists recorded characteristics such as the number of sessions, frequency, length of a session, duration of complete interventions, the time before the first session, and length of hospital stay. In order to describe and record the content of physiotherapy, physiotherapists were invited to use a standardized physiotherapy documentation form[20] hereby, called the DeJong form (supplementary material 1). The first author organized a teleconference with each physiotherapist involved in the research for training on using the documentation form. The first author at each site also organized a practical session. Filling out the original DeJong form after each therapy session is considered too time-consuming and not feasible for most attending physiotherapists. Therefore, they were asked to complete the documentation form during the first physiotherapy session, at 14 days and 30 days post-stroke, by recording the duration of each therapeutic activity in 5-minute intervals and coding the maximum five interventions used to facilitate the performance of

these activities. The relevant definitions of terms (supplementary material 2) were obtained from DeJong et al.[20,23]

2.5 Measurements

The National Institute of Health Stroke Score (NIHSS) was used to assess stroke severity.[24] The NIHSS is a reliable assessment tool used to quantify the severity of deficits in stroke people.[25]

The Motricity Index (MI) was used to measure strength in the upper and lower extremities. The MI is an ordinal tool to assess the motor impairment in a patient who has had a stroke.[26] The scores for the arm and leg range from 0 (minimum score) to 100 (maximum score).

The motor impairment of the trunk was assessed with the Trunk Control Test (TCT). The TCT is a valid tool for evaluating motor impairment in stroke patients.[27] The TCT showed a good sensitivity to change in assessing the recovery of stroke people.[28]

We used a 6-min walk test (6MWT) to measure walking endurance.[29] The 6MWT has demonstrated reliability and validity in stroke.[30,31] It assesses the distance a participant can walk as fast as possible for 6 min on a 30 m straight line with the option to stop for fatigue at any point.

The 10-meter Walk Test (10mWT) was used to measure walking speed. The 10mWT is a performance measure to assess walking speed in meters per second over a short distance.[29] Individuals are asked to walk the distance at a comfortable speed, and the time to cover the set distance is documented.

The Functional Independence Measure (FIM***)*** is an 18-item, clinician-reported scale that assesses function in six areas.[32] Two areas, such as self-care and mobility, were rated in our study. Scores range from 1 to 7 (1 = total assistance required, 7 = complete independence). Functional independence may be stratified as follows: score 1 or 2 (Complete dependence), 3 or 4 (Modified dependence), and five or more (Independent).

2.6 Sample size estimation

We used a purposive sampling approach to recruit participants. The minimal sample size was estimated using the Schwartz formula, N = (Zα2*p*q)/ i2, where N = minimal sample size, p = 1.16% (prevalence),[33] q = (1-p), Zα = 1,96 (for α = 5%), and i = 3% (accuracy). A margin of 10% was applied to cover potential refusals to participate. The minimal sample size required was 53.

2.7 Data analysis

We used descriptive statistics to describe sample characteristics and volume of sessions, including session duration, frequency, and the total number of sessions reported by physiotherapists. We reported the mean and standard deviation (SD) for normally distributed continuous data. In contrast, for skewed or ordinal data, we reported the median and interquartile range (IQR) and n (%) for categorical data. To determine the main activities used by physiotherapists, we calculated the total therapy time for each activity (addition of the time spent in the activity by each participant). Then, we calculated the ratio of time spent on each activity category by the total therapy time x 100. The proportions of therapy time spent on the activities were compared over time and according to the stroke severity using the Fisher test. We carried out a sub-analysis of the volume of sessions based on stroke severity by using the one-way analysis of variance (ANOVA) for variables with a normal distribution and Kruskal-Wallis one-way ANOVA for variables that did not comply with normal distribution. Friedman's non-parametric statistical test was used to compare results for successive measurements of the motricity index, FIM sub-scores, TCT, and 10mWT. Post-hoc analyses with Bonferroni adjustment were performed to investigate the specific differences in scores between T0, T1, and T2. P-values < 0.05 (two-tailed) indicated statistical significance.

3. Results

Figure 1 shows the flow chart of inclusion and follow-up of participants. Seventy-seven participants with stroke, including 64 (83.1%) inpatients and 13 (16.9%) outpatients, were enrolled, and assessed at baseline. Overall, 49 (76.6%) of the 64 inpatients were discharged before 1-month post-stroke, of whom 11 (22.4%) immediately resumed outpatient sessions, and 38 (77.6%) were lost to follow-up. Thus, at 1-month post-stroke, we reassessed 31 participants, including 23 outpatients and 8 inpatients.

[Figure 1 about here]

Table 1 presents the characteristics of stroke patients and their treating physiotherapists. The mean age of people with stroke at enrolment was 57.7±12.5 years, of which 53.2% were male. Most stroke participants had an ischemic stroke (66.2%) with moderate severity (63,6%). The main risk factor for stroke was hypertension (50.6%), followed by coexisting diabetes mellitus (23.4%).

Fifteen physiotherapists were included in the study. Their mean age was 31.3±5.8 years, of which 60% were male. The majority of physiotherapists (66.7%) had at least five years of experience in stroke rehabilitation (Table 1).

[Table 1 about here]

Table 2 presents all the activities used by the physiotherapists at different time points and their frequency (%). Our results found that the most frequently trained activities for participants were mainly pre-functional (17.1 % of time spent), gait (15.1 % of time spent), sitting (14.0 % of time spent), and pre-gait (12.4%). In comparing the proportion of time spent on each of the provided activities at the first session, at 2-week, and 1-month post-stroke, our results showed no significant difference over time ($p = 0.54$).

[Table 2 about here]

Within-group analyses showed that the proportion of therapy time did not vary significantly between the first session, the 2-week and 1-month post-stroke sessions (Figure 2) either for mild ($p= 0.12$), moderate ($p= 0.99$), or severe ($p= 0.09$) stroke. However, the between-group comparison showed that the therapy time varied with stroke severity ($p< 0.001$). Participants with mild stroke received significantly less therapy time than moderate or severe stroke participants.

[Figure 2 about here]

Table 3 presents the frequency (%) of use of each intervention delivered by the physiotherapists during the major activities, namely the activities on which the physiotherapists spent at least 10 min. Our findings reported that for pre-functional activity, musculoskeletal interventions covered 67% of interventions used by physiotherapists. It was about passive range of motion (PROM), stretching, strengthening, and motor control interventions. Around 53% of the interventions used during seated activity focused on neuromuscular interventions, including balance training, posture awareness, upper extremity interventions, and motor learning. Physiotherapists used several interventions during pre-gait activity, such as neuromuscular (25.5%), musculoskeletal (27.7%), and assistive devices (36.1%). During these interventions, the exercises frequently used were balance training, strengthening, and motor control. Regarding gait activity, mobilization and balance training were the most common musculoskeletal and neuromuscular interventions provided.

Our results showed that cardiopulmonary interventions were under-utilized, accounting for 4.3% of pre-gait activities and 8.3% of gait activities. In addition, interventions such as education and sensory, cognitive, and perceptual trainings were infrequently used. In the first month after stroke, physiotherapists spent 13 to 16 minutes on pre-functional activities, 10 to 13 minutes on sitting activities, 10 to 11 minutes on pre-gait activities and 11 to 15 minutes on gait activities for a median duration of 45 minutes per session.

[Table 3 about here]

Table 4 presents the overall volume of physiotherapy sessions during the first-month post-stroke. The mean frequency of inpatient sessions per week was median 5 (interquartile range (IQR) 2), with a mean of 45 min (IQR 10) per session and a mean total number of 9 (IQR 5) sessions in the first-month post-stroke. The mean length of hospital stay was 11.3 days (SD 6.1), with a mean time to first session of 5.1 days (SD 0.3). Our results showed that time per session (p= 0.032), length of hospital stay (p= 0.036), and time to first physiotherapy session (p= 0.006) varied with stroke severity. Participants with mild stroke received less treatment time per session and had the shortest hospital stay than participants with moderate or severe stroke. In contrast, participants with moderate stroke received their first physiotherapy session sooner than those with mild or severe stroke. In addition, our results reported that the frequency (p= 0.049) and total number (p= 0.032) of inpatient sessions received varied with stroke severity. Participants with mild strokes received fewer sessions than those with moderate or severe strokes.

[Table 4 about here]

Table 5 shows the change in functional recovery measurements over time. MI scores showed a slight but significant improvement between < 2-week and 2-week post-stroke (p= 0.033) and a significant improvement between 2-week and 1-month (p=0.001) and between < 2-week and 1-month (p< 0.001) post-stroke.

Trunk control test scores showed significant improvement between < 2-week and 2-week (p=0.002) and between < 2-week and 1-month post-stroke (p< 0.001). However, from 2-week to 1-month post-stroke, Trunk control test scores showed a slight but significant improvement (p=0.033).

The 10mWT showed a significant change between 2-week and 1-month (p= 0.007) and between < 2-week and 1-month post-stroke (p< 0.001), but not between <2-week and 2-week.

FIM sub-scores of walking (p= 0.011) and stair climbing (p= 0.004) showed a significant change between 2-week and 1-month and between < 2-week and 1-month (p< 0.001). However, the FIM sub-score for upper body dressing showed only significant improvement between < 2-week and 1-month post-stroke (p< 0.001).

[Table 5 about here]

4. Discussion

The present study documented the current contents of physiotherapy for people with acute and early subacute stroke in the hospital setting in Benin using a standardized form for documentation of physiotherapy interventions. This study showed that the amount of therapy time varied by stroke severity and did not progress over time. Our findings showed that physiotherapists in the acute phase of stroke showed little interest in aerobic therapy at any degree of stroke severity and at time point. Furthermore, our study reported that few therapy hours were delivered once outpatient.

Our finding that participants with mild stroke received less therapy, i.e., less time per session and less frequency per week, than those with moderate or severe stroke. Our findings are in line with a recent paper by Young et al. (2023),[34] who found that stroke survivors in the U.S. received low doses of therapy, and that stroke severity predicted higher subsequent therapy doses. However, these findings contrast with other earlier examining the effect of stroke severity on therapy provision, which found that patients with more severe stroke generally received less physiotherapy than patients with milder stroke.[35,36] Our results suggest that physiotherapists devote more time to patients with more motor impairments. Indeed, it is not surprising that physiotherapists devote most of their time and priority to patients with motor impairments, as they are generally trained in the rehabilitation of motor impairments. Gittins et al. (2020)[37] reported that the amount of stroke therapy is associated with unmodifiable

patient-related characteristics, such as the stroke severity and modifiable organizational factors, such as day and time of admission and the type of stroke team. However, the low dose of the therapy provided to less disabled patients found in the present study may be due to the admission status of patients. The inclusion of inpatients and outpatients may alter the amount of therapy received by patients, given the short inpatient stay reported in this study (mean±SD: 11.3±6.1 days). Similarly, after discharge from the hospital, most patients do not systematically resume rehabilitation for financial reasons.[17,38]

Our finding that the duration of physiotherapy sessions did not progress during the first-month post-stroke is not consistent with clinical guidelines for stroke patients.[11] Several factors may explain this lack of graduation in session length in the Benin context, including the internal requirements of each hospital, the lack of continuing education in stroke rehabilitation among most of the physiotherapists (60%) as reported by the current study, resulting in a lack of knowledge of recent recommendations for progressive stroke rehabilitation. The latter guidelines recommend a gradual progression of therapy time by 5 to 10 minutes every 1 to 2 weeks for the first 4 to 6 weeks and intensity by 5 to 10% of heart rate reserve every 1 to 4 weeks.[11]

The findings that physiotherapists treating acute stroke patients spent little time providing aerobic exercises compared to conventional neuromuscular and musculoskeletal interventions are inconsistent with current stroke rehabilitation recommendations in HICs.[10,11,39] Previous studies, particularly the study by Demetrios et al.(2016)[40] reported that a large proportion of therapy time was spent on activities to address impairments in body structure and function. Although conventional rehabilitation interventions help restoring motor function and body movement, most stroke survivors still have a long-term residual functional disability.[41] The growing body of evidence on stroke rehabilitation suggests that neuroplasticity and optimal motor recovery depend on several elements, such as repetition, the intensity of training, and

task specificity.[42,43] In clinical practice, aerobic exercise has been suggested to become a positive, task-oriented intervention to promote cardiovascular fitness, walking capacity, and balance after stroke,[11,44] with a preference for the seated aerobic training modality for those with significant motor deficits.[45] Exercise training leads to cortical reorganization, which is difficult to achieve with conventional rehabilitation interventions.[39,46] There are several reasons why aerobic therapy has been rarely used in low-income countries in the (sub)acute phase of stroke. These include lack of equipment,[18] lack of training in cardiovascular rehabilitation after stroke, and lack of awareness of its feasibility or effectiveness in this phase of stroke. However, the expertise of the treating physiotherapist may also influence the choice of treatment type. It would be interesting to explore this factor in future stroke rehabilitation studies. Our results suggest that the applicability and effectiveness of aerobic therapy strongly recommended in stroke guidelines in HICs should be investigated to strengthen the therapeutic platform in low-income countries.

Our finding that few patients received outpatient physiotherapy after discharge is consistent with previous studies conducted in LMICs.[13,47] Several explanations can support this finding in LMICs. In Benin, for example, there is still no compulsory health insurance. Only 8% of the population is covered by health insurance.[17] As a result, many patients still pay the total cost of rehabilitation out of their pocket. Only those working in the public or formal private sectors are entitled to health care reimbursement. Another explanation is that the lack of stroke rehabilitation services in remote areas and physiotherapists to reduce transportation costs may be another barrier to participation in outpatient physiotherapy. A previous study in Ghana, west Africa, reported that financial dependence and transportation costs were the main barriers to accessing physiotherapy services.[38] Public health policies must be implemented to make rehabilitation services accessible and affordable in low-income countries.[13] Mobile

health apps could also be an alternative to encourage physical activity among stroke survivors residing in remote areas where rehabilitation services do not exist.

Our results showed that motor impairments measured by MI and trunk control test showed significant improvements at two weeks and 1-month post-stroke. By contrast, the 10mWT and the FIM showed a significant improvement at 1-month post-stroke, but not at 2 weeks. These results would suggest that physiotherapists focused more on motor recovery than on functional activities in the first two weeks after stroke. This could be justified by the high use of neuromuscular and musculoskeletal interventions found in our study. Implementing specific task-oriented approaches as soon as possible could lead to faster improvement in activities such as walking, climbing stairs, or dressing. It has been shown that task-oriented training produced statistically significant and clinically meaningful improvements in paretic upper extremity functional performance in patients with subacute stroke after 2-week of training compared to conventional interventions.[48] However, the large activity limitation of the participants at admission in our study may also explain this lack of significant change at 2-week post-stroke.

Strengths and limitations

As far as we know, this is the first study in Western Africa to describe the type and volume of physiotherapy interventions in acute and early sub-acute stroke using a taxonomy of stroke rehabilitation.[20] First, participants were recruited from several hospitals located in different regions of the country. In addition, the number of patients included in the study was above the estimated sample size. Consequently, we believe that our results can be generalized to stroke population in Benin. Our results could also serve as a basis for developing a policy aimed at increasing the number of stroke rehabilitation centers, equipping existing centers in low-income countries, and providing continuing education for physiotherapists in the field of

cardiac rehabilitation. However, this study has some potential limitations. First, because the treating physiotherapists themselves did the documentation of interventions in their practice settings, this may bias the reliability of the data as these therapists may overestimate the dosage of treatments administered or document interventions in a way that they thought would reflect positively on their practice. Although it was difficult to have complete control over the information provided by the therapists, as much as possible, they were encouraged to give truthful responses bearing in mind the long-term benefits of the study for the profession. Second, we did not collect information on participants' health insurance status, which did not allow us to assess its impact on the amount of therapy provided. In addition, discharge, and the switch from inpatient to outpatient care may have reduced the amount of therapy provided. However, it is beyond the scope of this study to identify factors associated with the volume of therapy provided. Future studies will address this issue.

5. Conclusion

Overall, physiotherapists working with (sub)acute stroke in Benin focused on neuromuscular and musculoskeletal interventions and spent little time on aerobic therapy, regardless of stroke severity. Our study showed that the duration of therapy delivered varied with stroke severity and did not progress over time. In addition, our results showed significant improvements in motricity index and trunk control test at 2-week and 1-month post-stroke while 10-meter walk test, functional independence measure sub-scores of walking, stair climbing, and dressing upper body significantly increased at 1-month, but not at 2-week post-stroke.

Figure legends

Figure 1. Flowchart of participants

Figure 2. Physiotherapy activities mostly used in stroke rehabilitation based on stroke severity

Reference

1. Katan M, Luft A. Global Burden of Stroke. *Semin Neurol*. 2018;38:208-211.

2. Kim J, Thayabaranathan T, Donnan GA, et al. Global Stroke Statistics 2019. *Int J Stroke Off J Int Stroke Soc*. 2020;15:819-838.

3. Adoukonou T, Kossi O, Fotso Mefo P, et al. Stroke case fatality in sub-Saharan Africa: Systematic review and meta-analysis. *Int J Stroke*. 2021;16:902-916.

4. Billinger SA, Arena R, Bernhardt J, et al. Physical activity and exercise recommendations for stroke survivors: a statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2014;45:2532-2553.

5. Kossi O, Bonnechère B, Agbetou M, et al. Relationships between cardiorespiratory fitness, physical activity practices, and functional outcomes one-year post-stroke in northern Benin: A case-control study. *Top Stroke Rehabil*. 2023:1-12.

6. Saunders DH, Sanderson M, Hayes S, et al. Physical fitness training for stroke patients. *Cochrane Database Syst Rev*. 2020;3:CD003316.

7. Krakauer JW, Carmichael ST, Corbett D, et al. Getting neurorehabilitation right: what can be learned from animal models? *Neurorehabil Neural Repair*. 2012;26:923-931.

8. Bernhardt J, Godecke E, Johnson L, et al. Early rehabilitation after stroke. *Curr Opin Neurol*. 2017;30:48-54.

9. Winstein CJ, Stein J, Arena R, et al. Guidelines for Adult Stroke Rehabilitation and Recovery: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. *Stroke*. 2016;47:e98-e169.

10. Kleindorfer DO, Towfighi A, Chaturvedi S, et al. 2021 Guideline for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack: A Guideline From the American Heart Association/American Stroke Association. *Stroke*. 2021;52.

11. MacKay-Lyons M, Billinger SA, Eng JJ, et al. Aerobic Exercise Recommendations to Optimize Best Practices in Care After Stroke: AEROBICS 2019 Update. *Phys Ther*. 2020;100:149-156.

12. Guidelines Content Working Party. Clinical Guidelines for Stroke Management 2017. Stroke Foundation, 2017.

13. Owolabi MO, Thrift AG, Martins S, et al. The state of stroke services across the globe: Report of World Stroke Organization-World Health Organization surveys. *Int J Stroke Off J Int Stroke Soc*. 2021;16:889-901.

14. Kengne AP, Anderson CS. The neglected burden of stroke in Sub-Saharan Africa. *Int J Stroke Off J Int Stroke Soc*. 2006;1:180-190.

15. Quinn T, Paolucci S, Sunnerhagen K, et al. Evidence-based stroke rehabilitation: An expanded guidance document from the European Stroke Organisation (ESO) guidelines

for management of ischaemic stroke and transient ischaemic attack 2008. *J Rehabil Med Off J UEMS Eur Board Phys Rehabil Med*. 2009;41:99-111.

16. Agho AO, John EB. Occupational therapy and physiotherapy education and workforce in Anglophone sub-Saharan Africa countries. *Hum Resour Health*. 2017;15:37.

17. Deville C, Fecher F, Poncelet M. L'Assurance pour le renforcement du capital humain (ARCH) au Bénin : processus d'élaboration et défis de mise en œuvre. *Rev Fr Aff Soc*. 2018;2018:107-123.

18. Negrini S. The World Health Organization "Rehabilitation 2030: a call for action".

19. Kossi O, Batcho C, Adoukonou T, et al. Functional recovery after stroke in Benin: A six-month follow-up study. *J Rehabil Med*. 2016;48:671-675.

20. DeJong G, Horn SD, Gassaway JA, et al. Toward a taxonomy of rehabilitation interventions: using an inductive approach to examine the "black box" of rehabilitation. *Arch Phys Med Rehabil*. 2004;85:678-686.

21. Jette DU, Latham NK, Smout RJ, et al. Physical Therapy Interventions for Patients With Stroke in Inpatient Rehabilitation Facilities. *Phys Ther*. 2005;85:238-248.

22. Latham NK, Jette DU, Slavin M, et al. Physical Therapy During Stroke Rehabilitation for People With Different Walking Abilities. *Arch Phys Med Rehabil*. 2005;86:41-50.

23. DeJong G, Hsieh CH, Putman K, et al. Physical Therapy Activities in Stroke, Knee Arthroplasty, and Traumatic Brain Injury Rehabilitation: Their Variation, Similarities, and Association With Functional Outcomes. *Phys Ther*. 2011;91:1826-1837.

24. Brott T, Adams HP, Olinger CP, et al. Measurements of acute cerebral infarction: a clinical examination scale. *Stroke*. 1989;20:864-870.

25. Dewey HM, Donnan GA, Freeman EJ, et al. Interrater reliability of the National Institutes of Health Stroke Scale: rating by neurologists and nurses in a community-based stroke incidence study. *Cerebrovasc Dis Basel Switz*. 1999;9:323-327.

26. Fayazi M, Dehkordi SN, Dadgoo M, et al. Test-retest reliability of Motricity Index strength assessments for lower extremity in post stroke hemiparesis. *Med J Islam Repub Iran*. 2012;26:27-30.

27. Collin C, Wade D. Assessing motor impairment after stroke: a pilot reliability study. *J Neurol Neurosurg Psychiatry*. 1990;53:576-579.

28. Franchignoni FP, Tesio L, Ricupero C, et al. Trunk Control Test as an Early Predictor of Stroke Rehabilitation Outcome. *Stroke*. 1997;28:1382-1385.

29. Cheng DK, Nelson M, Brooks D, et al. Validation of stroke-specific protocols for the 10-meter walk test and 6-minute walk test conducted using 15-meter and 30-meter walkways. *Top Stroke Rehabil*. 2020;27:251-261.

30. Lexell J, Flansbjer UB, Holmbäck AM, et al. Reliability of gait performance tests in men and women with hemiparesis after stroke. *J Rehabil Med*. 2005;37:75-82.

31. Fulk GD, Echternach JL, Nof L, et al. Clinometric properties of the six-minute walk test in individuals undergoing rehabilitation poststroke. *Physiother Theory Pract*. 2008;24:195-204.

32. Keith RA, Granger CV, Hamilton BB, et al. The functional independence measure: a new tool for rehabilitation. *Adv Clin Rehabil*. 1987;1:6-18.

33. Adoukonou T, Yahouédéou B, Agbétou M, et al. Prevalence of stroke survivors in Parakou in northern Benin: A door-to-door community survey. *Rev Neurol (Paris)*. 2020;176:839-845.

34. Young BM, Holman EA, Cramer SC, et al. Rehabilitation Therapy Doses Are Low After Stroke and Predicted by Clinical Factors. *Stroke*. 2023;54:831-839.

35. James J, McGlinchey MP. How active are stroke patients in physiotherapy sessions and is this associated with stroke severity? *Disabil Rehabil*. 2021:1-7.

36. McGlinchey MP, Paley L, Hoffman A, et al. Physiotherapy provision to hospitalised stroke patients: Analysis from the UK Sentinel Stroke National Audit Programme. *Eur Stroke J*. 2019;4:75-84.

37. Gittins M, Vail A, Bowen A, et al. Factors influencing the amount of therapy received during inpatient stroke care: an analysis of data from the UK Sentinel Stroke National Audit Programme. *Clin Rehabil*. 2020;34:981-991.

38. Nketia-Kyere M, Aryeetey GC, Nonvignon J, et al. Exploring barriers to accessing physiotherapy services for stroke patients at Tema general hospital, Ghana. *Arch Physiother*. 2017;7.

39. Kim Y, Lai B, Mehta T, et al. Exercise Training Guidelines for Multiple Sclerosis, Stroke, and Parkinson Disease: Rapid Review and Synthesis. *Am J Phys Med Rehabil*. 2019;98:613-621.

40. Demetrios M, Brand C, Louie J, et al. More than a black box of rehabilitation: Characterizing therapy programmes following botulinum toxin injections for spasticity in adults with stroke. *J Rehabil Med*. 2016;48:426-434.

41. Saposnik G. Virtual Reality in Stroke Rehabilitation. In: Ovbiagele B, ed. *Ischemic Stroke Therapeutics: A Comprehensive Guide*. Springer International Publishing; 2016:225-233.

42. Malik AN, Tariq H, Afridi A, et al. Technological advancements in stroke rehabilitation. *JPMA J Pak Med Assoc*. 2022;72:1672-1674.

43. Amanzonwé ER, Triccas LT, Codjo L, et al. Exercise dosage to facilitate the recovery of balance, walking, and quality of life after stroke. *South Afr J Physiother*. 2023;79.

44. Saunders DH, Sanderson M, Hayes S, et al. Physical fitness training for stroke patients. *Cochrane Database Syst Rev*. 2016;3:CD003316.

45. Crozier J, Roig M, Eng JJ, et al. High-Intensity Interval Training After Stroke: An Opportunity to Promote Functional Recovery, Cardiovascular Health, and Neuroplasticity. *Neurorehabil Neural Repair*. 2018;32:543-556.

46. Gorman C, Gustafsson L. The use of augmented reality for rehabilitation after stroke: a narrative review. *Disabil Rehabil Assist Technol*. 2022;17:409-417.

47. Olaleye OA, Lawal ZI. Utilization of physiotherapy in the continuum of stroke care at a tertiary hospital in Ibadan, Nigeria. *Afr Health Sci*. 2017;17:79.

48. Thant AA, Wanpen S, Nualnetr N, et al. Effects of task-oriented training on upper extremity functional performance in patients with sub-acute stroke: a randomized controlled trial. *J Phys Ther Sci*. 2019;31:82-87.

Table 3. Physiotherapy interventions used to facilitate the most common activities.

	Physiotherapy activities			
Interventions	Pre-functional	Sitting	Pre-gait	Gait
Neuromuscular, n%				
Balance training	2.7	20.6	14.9	16.6
Postural awareness	4.8	20.0	8.5	
Motor learning	3.2	3.5	2.1	8.3
PNF	2.7			
NDT	6.4			
Involved upper extremity addressed	9.6	8.5		
Musculoskeletal, n%				
Strengthening	23.7	14.2	12.8	
Mobilization			2.1	25.0
PROM/Stretching	30.5	2.8		
Motor control	12.8	17.7	12.8	4.2
Cardiopulmonary, n%				
Aerobic exercise			4.3	8.3
Cognition/Perceptuel/Sensory, n%				
Perceptual training, **n%**		1.4		
Visual training		1.4		
Education, n%				
Patient	1.6	2.1	2.1	4.2
Familiy/Caregiver		4.3	4.3	
Assistive device, n%				
Crutches-Foream				4.2
Lite gait				8.3
Parallel bars			12.8	4.2
Standing frame			2.1	4.2
Steps			19.1	12.5
Walker-FWW			2.1	
Activity time, min, mean (SD)				
< 2-week	13.1 (5.4)	10.4 (5.7)	10.0 (4.3)	11.2 (5.2)
2-week	15.9 (5.7)	12.6 (5.2)	10.5 (3.8)	13.1 (4.2)
1-month	14.5 (5.9)	12.7 (6.7)	11.2 (4.2)	14.7 (4.3)

Note: only interventions for which the frequency of use in each activity is ≥ 1% are reported. Only activities on which the mean time spent is ≥ 10 min are reported.

Abbreviations: PNF, proprioceptive neuromuscular facilitation; NDT, neurodevelopmental therapy; PROM, passive range of movement; FWW, front-wheel walker

Table 5. Evolution of functional recovery of participants over time.

					Post-hoc**		
Measures	< 2 weeks (T0)	2 weeks (T1)	1-month (T2)	P-value*	T0 vs T1	T1 vs T2	T0 vs T2
MI (0-100), median (IQR)	10 (1-42)	36.5 (18.5-56.0)	62.0 (34.0-78.1)	< 0.001	0.033	0.001	< 0.001
TCT (0-100), median (IQR)	24 (0-49)	55 (12-87)	87 (45.2-100)	< 0.001	0.002	0.033	< 0.001
10mWT, $m.S^{-1}$, median (IQR)	0.0 (0.0-0.0)	0.0 (0.0-0.2)	0.2 (0.-0.6)	< 0.001	0.143#	0.007	< 0.001
FIM-d*ressing UB* *(0-7)*, median (IQR)	1 (1-2)	2 (1-3)	3 (2-7)	< 0.001	0.269#	0.17#	< 0.001
FIM-w*alking* *(0-7)*, median (IQR)	1 (1-2)	2 (1-3)	4 (2.5-6.0)	< 0.001	0.121#	0.011	< 0.001
FIM-stairs *(0-7)*, median (IQR)	1 (1-1)	1 (1-3)	3 (1-6)	< 0.001	0.413#	0.004	< 0.001

*Friedman test; **Bonferroni correction test

Abbreviations: MI, motricity index; FIM, functional independence measure; UB, upper body; TCT, trunk control test; 10mWT, 10-meter walk test; #, no significant difference.

Table 2. Frequency of various activities performed by physiotherapists.

Physiotherapy Activities	< 2-week (time%)	2-week (time%)	1-month (time%)	Total therapy time (%)*
Pre-functional	13	16	15	17.1
Gait	11	13	15	15.1
Sitting	10	13	13	14.0
Pre-gait	10	11	11	12.4
Bed mobility	10	9	10	11.2
Physical assessment	28	0	0	10.8
Sit-to-stand	8	9	9	10.1
Transfers	8	8	8	9.3
P-value		0.54		

*Only activities for which at least 5% of the total time was spent are included.

Highlights

- Physiotherapists working with sub(acute) stroke people focused on neuromuscular and musculoskeletal approaches.
- Endurance exercises were rarely employed regardless of stroke severity.
- Physiotherapists delivered less therapy time to mild stroke people.
- For all disability levels, the therapy time did not progress over time.