KNOWLEDGE AND UTILIZATION OF STROKE ASSESSMENT SCALES AMONG NEUROLOGICAL PHYSIOTHERAPISTS IN SELECTED HOSPITALS IN BENIN CITY, EDO STATE

BY

OLUWAPONMILE PRAISE AYOMIDE

(BMS2009048)

A PROJECT SUBMITTED TO THE DEPARTMENT OF PHYSIOTHERAPY, SCHOOL OF BASIC MEDICAL SCIENCES, COLLEGE OF MEDICAL SCIENCES, UNIVERSITY OF BENIN IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF PHYSIOTHERAPY (B.PT) DEGREE.

OCTOBER, 2025.

CERTIFICATION

This dissertation by OLUWAPONMILE PRAISE AYOMIDE is accepted in present form as satisfying the dissertation requirement of the degree of Bachelor of Physiotherapy of the School of Basic Medical Sciences, College of Medical Sciences of the University of Benin.

DR ADEBISI HAMMED _____

SUPERVISOR SIGNATURE AND DATE

EXTERNAL EXAMINER _____

SIGNATURE AND DATE

APPROVED

_____

DR. C. O. OBASEKI

HEAD OF DEPARTMENT,

PHYSIOTHERAPY,

COLLEGE OF MEDICAL SCIENCES,

UNIVERSITY OF BENIN.

DEDICATION

I dedicate this work to God almighty, the source of my strength, my parents, my siblings and friends who stood by me through this entire journey. I love and appreciate you all for your prayers, love and support.

ABSTRACT

Background: Stroke remains one of the leading causes of adult disability worldwide, requiring standardized assessment tools to ensure accurate evaluation and effective rehabilitation. Despite their clinical importance, the knowledge and utilization of stroke assessment scales among neurological physiotherapists in Nigeria remains inconsistent. This study sought to address this gap by assessing the knowledge and clinical application of stroke assessment scales among neurological physiotherapist in Benin City, Edo State.

Aim: This study evaluated the knowledge and utilization of stroke assessment scales among neurological physiotherapists in Benin City, Edo State.

Method: A descriptive cross-sectional survey of 43 licenced neurological physiotherapists was conducted using a validated questionnaire. Data were analysed with SPSS (v27) using descriptive and Chi-square statistics at a 0.05 significance level.

Results: Most respondents showed fair knowledge (55.8%) and moderate utilization (46.5%) of stroke assessment scales. A significant association existed between knowledge and utilization ($p = 0.010$). Gender was found to influence knowledge level although educational qualification and professional cadre showed no significant relationship.

Conclusion: Neurological physiotherapists in Benin City possess moderate knowledge and usage of stroke assessment scales, yet a critical gap persists between awareness and practice. Strengthening continuous professional development and institutional support is essential to bridge this gap and foster evidence based standardized stroke rehabilitation.

Keywords: Knowledge, Utilization, Stroke Assessment Scale, Physiotherapists.

ACKNOWLEDGEMENT

I am deeply grateful to Almighty God for his guidance, strength and wisdom throughout the course of my study and the successful completion of this dissertation.

My profound appreciation goes to my supervisor, Dr Adebisi Hammed, whose invaluable guidance, constructive criticism and continuous encouragement have been pivotal in shaping this work. Your patience, dedication and academic insight have greatly contributed to the quality of this dissertation and to my personal and professional growth.

I also extend my sincere thanks to the Department of Physiotherapy, College of Medical Sciences of University of Benin and to all my lecturers, for the knowledge and mentorship I have received throughout my academic journey.

I am particularly indebted to the respondents who willingly gave their time, experience and perspective. Your contributions formed the foundation of this study and for that I remain truly grateful.

On a personal note, I owe immense gratitude to my parents Mr and Mrs Oluwaponmile, whose sacrifice, prayers and encouragement have been my greatest source of strength. To my siblings, your unwavering support, motivation and understanding during challenging times have been invaluable. I would also love to give my love and thanks to friends turned sisters like Nmosi Isioma and Okotete Eseoghene, I really appreciate your help thus far. I would also like to acknowledge Okolo Grace, Ekuase Daisy and every other person who was a part of this journey.

To colleagues, friends and loved ones who in one way or another supported me throughout this journey, I say thank you. This work is as much yours as it is mine.

TABLE OF CONTENTS

LIST OF TABLE

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Stroke is defined as a rapidly developing clinical sign of focal or global disturbances of cerebral function that lasts for than 24 hours or leads to death, with no apparent cause other than that of vascular origin (WHO, 1970). Also, the American Stroke Association (2013) defined stroke as an objective evidence of permanent brain, spinal cord or retinal cell death due to vascular cause and this is based upon pathological or imaging evidence with or without the presence of clinical symptoms. Stroke incidence in Nigeria and other African countries has also be known to have greatly increased and it has been closely linked to epidemiological and demographic changes along with rapid economic expansion and rural-to-urban migration as leading factors in these regions (Adeloye et al., 2019). In 2017, statistics also estimated about 9.53 million stroke survivors in the European Union (EU). By 2047, it is predicted for that number to rise exponentially to approximately 12.11 million, representing a 27% relative increase (Wafa et al., 2020). According to recent reports, the annual incidence of stroke in Africa is estimated to be around 316 case per 100,000 people. In Nigeria, the current data indicates a lower rate of about 26 per 100,000 people (Akinyemi et al., 2021).

Stroke represents a significant public health concern due to its high mortality, disability, and recurrence rates, the complications that arise from the acute stroke event appears to present far greater challenges. (Guo et al., 2021). These challenges can present in form of prolonged disability, reduced quality of life

and increased healthcare burden and encompasses physical, cognitive, emotional, social and economic dimensions, affecting not just the patients but also the caregivers. (Seble et al., 2023). This further re-emphasizes the need for comprehensive stroke prevention, acute care and rehabilitation strategies. In addition, over 70% of stroke survivors experience motor and other neurological functional disabilities which significantly affects their independence and overall quality of life (Shehong et al., 2022). These motor deficits necessitates rehabilitation strategies that targets at restoring optimal function and mobility. Early and targeted physiotherapy intervention is essential to maximize neuroplasticity, promote functional recovery and enhance overall patient outcomes (Shehong et al., 2022).

Assessment is the first step in stroke rehabilitation process as it provides the baseline on which clinical decisions are made. It is clearly seen in clinical practice that the clinical outcome is directly dependent on the assessment done on the patient. Hence, the clinical assessment of stroke involves a comprehensive evaluation with information of the patient's medical history and this probes into presence of risk factors such as hypertension, diabetes, smoking, heart disease or previous stroke. A thorough physical examination is also carried out, focusing on neurological assessments evaluating motor function, sensation, coordination, reflexes and cranial nerve function. Stroke assessment scales are standardized instruments utilized by healthcare professionals including physiotherapists to evaluate the physical, cognitive and functional impairments caused by a stroke. These tools help to determine the severity of the stroke, tract recovery progress and guide rehabilitation planning. (Hana, 2023)

Moreover, a stroke assessment scale is an effective tool for determining the severity of a stroke at its start and evaluation prognostic data along course of treatment. Each characteristics is categorized for scoring and there are multiple variables for observing stroke signs and symptoms. All across the world, stroke scales focus on things like consciousness level, d isability, mental status screening for activities of daily living, motor function, b alance, mobility, speech and language function, health status, and quality of li fe metrics (Okafor et al., 2010).

More so, the utilization of assessment scales allows for the objective assessment and establishment of the impact and influence of treatment in the management of stroke; consequently, there is a strong global recommendation to adopt assessment scales (Seth et al., 2020). The London based Intercollegiate Stroke Working Party (2016) released clinical guidelines for stroke management and stated that assessment scales are the most effective way to quantify function, which is crucial to stroke patients' rehabilitation. Based on the international classification of function, disability and health, the World Health Organization (WHO) highlighted a number of evaluation instruments that medical practitioners use to evaluate stroke. Some examples of these scales include: National Institute of Health Stroke Scale (NIHSS), Fugl-Meyer assessment (FMA), Modified ashworth Scale (MAS), Barthel Index(BI), Functional Independence Measure (FIM), 10-meter gait speed test, 6minute walk test, Timed up and go, Modified Rankin scale (mRS), Berg Balance Scale (BBS), Stroke Impact Scale (SIS), Stroke Specific Quality of Life (SS-QoL), and Mini Mental Stroke Examination. (Seth et al., 2020).

Despite the recognized importance of these tools, their knowledge and utilization among physiotherapists varies globally. In Nigeria, studies have shown a gap between the knowledge of stroke assessment scales and their practical utilization. A study conducted in Anambra state (2023) revealed that while physiotherapists acknowledged the relevance of these assessment scales, their utilization in clinical settings was limited (Okonkwo et al., 2023). Understanding the knowledge and practices of neurological physiotherapists regarding stroke assessment scales is crucial for developing targeted interventions aimed at enhancing their adoption. By identifying the existing gaps and barriers, stakeholders can implement strategies such as continuous professional development programs, incorporation of standardized assessment training in curricula and policy reforms to promote the consistent use of these tools. Such measures are important for improving the quality of stroke rehabilitation services and ensuring optimal patient outcomes.

1.2 Statement of the Problem

Standardized stroke assessment scales are important tools that help bring about objective evaluation of patients progress and informing clinical decisions (Jose, 2023). These tools also play a vital role in promoting consistent communication across multidisciplinary care teams. Despite their proven relevance, the adoption and consistent use of these scales by neurological physiotherapists, particularly in low and middle income countries like Nigeria seem to be inconsistent (Odole et al., 2018).

The persistent gap between the acknowledged importance of stroke assessment scales and their actual implementation in clinical practice presents a critical

challenge in physiotherapy care. Without adequate knowledge and consistent use of these tools, Physiotherapists may be limited in their capacity to provide evidence based standardized care, potentially compromising patient's quality of care. Acknowledging and addressing this gap is essential to enhance the quality of stroke rehabilitation service and ensure optimal recovery for stroke survivors.

A national study done in Nigeria reported that while 66.7% of physiotherapists were aware of stroke assessment scales, only about 28% had received formal training on their use during their professional education. Moreover, 70% of respondents did not recruit them routinely citing barriers like high patient load and time constraints (Okafor et al., 2010). Similarly, a survey conducted in tertiary health institutions in Anambra State in Nigeria revealed that 37.5% of physiotherapists had poor knowledge of standard outcome measures (SOMs) and only about 20% demonstrated good utilization in clinical practice. Factors such as educational qualification, years of experience and workplace setting were found to influence both knowledge and utilization levels of these SOMs (Okonkwo et al., 2023). The previous studies have highlighted the knowledge gap in other regions of the country but as far as the researcher knows, there is none to highlight the knowledge gap in south-south region, Edo State, Benin City.

1.3 Research Question

The study therefore aims to answer the following questions;

i. What is the level of knowledge among neurological physiotherapists regarding standardized stroke assessment scales?

ii. How frequently do neurological physiotherapists utilize these scales in clinical practice?

iii. What is the association between knowledge of stroke assessment and the gender of the respondents?

iv. What is the association between knowledge of stroke assessment scales and the highest educational qualification of the respondents?

v. What is the association between knowledge of stroke assessment scales and professional cadre of the respondents?

vi. What is the association between utilization of stroke assessment scales and the gender of the respondents?

vii. What is the association between utilization of the stroke assessment and the highest educational qualification of the respondents?

viii. What is the association between utilization of stroke assessment scales and the professional cadre of the respondents?

ix. What is the association between the knowledge of stroke assessment scale and the utilization of stroke assessment scales?

1.4 Aim of the Study

The study aims to assess the knowledge and clinical utilization of stroke assessment scales among neurological physiotherapists.

1.4.1 Specific Objectives

The specific objectives of this study is:

i. To evaluate the level of knowledge physiotherapist have regarding standardized stroke assessment scales.

ii. To assess the relationship between knowledge of stroke assessment scales and the gender of the respondents.

iii. To assess the relationship between knowledge of stroke assessment scales and the highest educational qualification and professional cadre of the respondents.

iv. To examine the frequency of use of stroke assessment scales in clinical practice.

v. To examine the relationship between utilization of stroke assessment scales and the gender of the respondents.

vi. To examine the relationship between the use of stroke assessment scales and the highest educational qualification and professional cadre of the respondents.

vii. To assess the relationship between the knowledge of stroke assessment scale and the utilization of stroke assessment scales.

viii. To identify barriers and facilitators affecting the adoption of these scales among neurological physiotherapists.

ix. To provide recommendations for improving awareness, training and standardized use of stroke assessment tools in rehabilitation settings.

1.5 Hypothesis

1.5.1 Main Hypothesis

i. There is no significant association between neurological physiotherapists' knowledge and the actual utilization of stroke assessment scales in clinical practice.

1.5.2 Sub-hypothesis

i. There is no significant association between knowledge of stroke assessment scales and gender of the respondents.
ii. There is no significant association between knowledge of stroke assessment scales and the highest educational qualification of the respondents.
iii. There is no significant association between knowledge of stroke assessment scales and professional cadre or rank of the respondents.
iv. There is no significant association between utilization of stroke assessment scales and the gender of the respondents.
v. There is no significant association between utilization of stroke assessment scales and the highest educational qualification of the respondents.
vi. There is no significant association between utilization of stroke assessment scales and professional cadre or rank of the respondents.

1.6 Significance of the study

The beneficiaries of this study includes the patients, neurological physiotherapist, health institutions and the field of neurological physiotherapy.

This study is significant in ensuring patients receive assessment using validated standardized tools leading to more accurate diagnosis of deficits and personalized rehabilitation plans. It facilitates better tracking of progress allowing physiotherapist to adjust interventions promptly, potentially accelerating functional recovery and independence. It enables collaborative measurable and patient-centred goal setting based on objective data, improving

motivation and patient engagement. It promotes early identification of specific impairments allowing for timely referrals and interventions, preventing secondary complications. It also reduces variability in assessment quality across different healthcare providers ensuring more reliable baseline data.

Likewise, the study is significant to the neurological physiotherapist as it helps identify knowledge gaps, guiding targeted continuing professional development (CPD). It provides data to support the use of standardized scales, strengthening clinical reasoning and justifying treatment plans to colleagues, patients and caregivers. It highlights barriers to scale use initiating solutions for more efficient integration into health services, leading to clearer objective documentation. It also demonstrates adherence to best practices through standardized assessment potentially mitigating medico-legal risks.

In healthcare institutions, this study identifies training needs and barriers, allowing targeted investment in staff development. It facilitates clearer objective communication between neurological physiotherapists and other healthcare providers like doctors and occupational therapists using common scales and score, enhancing team coordination. It reduces practice variation and potential errors improving patient safety and institutional reputation in stroke care.

Furthermore, for health policy makers, this study is significant in reinforcing the specialized expertise of neurological physiotherapists and their critical role in objective measurement within the stroke rehabilitation team. It drives advocacy for wider adoption and integration of evidence based tools globally. It also generates crucial data on current practices and gaps in a core area of

neurological rehabilitation, informing future research priorities, guideline development and educational curricula.

1.7 Scope and Delimitation

This study was delimited to:

i. Licensed neurological physiotherapists.
ii. Neurological Physiotherapists working in hospitals rehabilitation centres or outpatient clinics.
iii. Physiotherapists who manage acute, sub-acute or chronic stroke patients.
iv. Physiotherapists working within Benin City, Edo state.

1.8 Limitation of the study

i. Findings may not apply to all physiotherapist as the sample is restricted to a specific location – Benin City, Edo State.
ii. Reliance on surveys as against clinical practice may not reflect actual clinical practice.

1.9 Definition of Terms

i. Knowledge: is the awareness or familiarity acquired through experience or education. It is the theoretical and practical understanding of a subject (oxford languages).
ii. Utilization: is the act of putting something into use (Merriam Webstar).

iii. Stroke assessment scales: are standardized tools that quantify neurological disability used for accessing and guiding decisions in acute management and rehabilitative treatment (Siniscalchi, 2022).

iv. Physiotherapists: are healthcare providers concerned with identifying and maximizing quality of life and movement potential within the spheres of prevention, promotion, treatment or intervention and rehabilitation (WCPT., 2019).

v. Neurological Physiotherapist: are specialized physiotherapists who focus on treating individuals with neurological conditions affecting the brain, spinal cord or peripheral nerves. They help patients improve movement, balance and functional abilities following injuries or illnesses like stroke, spinal cord injury or Parkinson's disease (Lana, 2022).

1.10 List of Abbreviations

BBS – Berg Balance Scale

BI – Barthel Index

DALYs – Disability Adjusted Life Year

EU – European Union

FIM – Functional Independence Measure

FMA – Fugl-Meyer Assessment

LMIC – Lower Middle Income Countries

MAS – Modified Ashworth Scale

mRS – Modified Rankin Scale

NHISS – National Institutes of Health Stroke Scale

SIS – Stroke Impact Scale

SS-QoL – stroke Specific Quality of Life scale

WCPT – World Confederation of Physical Therapy

WHO – World Health Organization

WSO –World Stroke Organization

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Framework

2.1.1 The Knowledge To Action (KTA) Framework

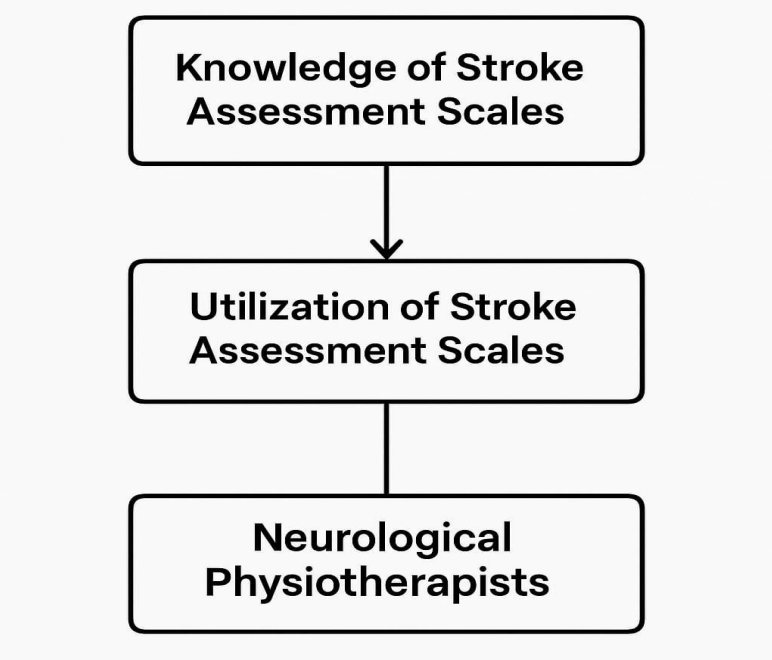

Figure 1: Simplified Conceptual Framework

Health practitioners around the world face the same challenges: turning the best available evidence into actual health interventions in a timely manner in order to offer the most effective care and service. The KTA framework which was developed by Graham et al. (2006) is a conceptual framework designed to assist knowledge translation practitioners in delivering long term evidence based interventions. Conceptual frameworks offer a framework for structuring ideas, as well as a roadmap for action and interpretation. Applying a conceptual framework could have several advantages such as making the knowledge translation process more systematic and increasing the possibility of practice change and evidence dissemination. (Field et al., 2014).

In the context of this study, the framework is used to explore how neurological physiotherapists acquire knowledge about stroke assessment scales and how this knowledge is ultimately applied in clinical settings. The framework is structured into two major components: Knowledge Creation and the Action Cycle.

The knowledge creation component consists of three progressive phases that refine raw research findings into usable clinical tools: Knowledge inquiry, knowledge synthesis and knowledge tools and products. Knowledge Inquiry refers to the generation of primary studies, such as research articles, clinical trials, and guidelines that investigate the validity, reliability, and clinical utility of various stroke assessment scales. Physiotherapists may encounter this knowledge through formal education, journal articles, conferences, and seminars. Knowledge Synthesis involves compiling and summarizing information from multiple sources, such as systematic reviews and evidence-based guidelines, to provide comprehensive understanding. Examples include stroke rehabilitation guidelines that recommend the use of validated assessment tools like the National Institutes of Health Stroke Scale (NIHSS) and the Fugl-Meyer Assessment. Knowledge Tools and Products emerge from synthesized knowledge and are designed to facilitate implementation. These include manuals, quick-reference guides, mobile apps, and structured protocols that help physiotherapists easily apply stroke assessment scales in practice. Together, these three phases form the foundational knowledge base necessary for effective clinical application.

The action cycle represents the dynamic, iterative process of implementing and sustaining the use of clinical knowledge in practice. It consists of several

interrelated stages: Identification of the Problem (Know-Do Gap) marks the recognition that, despite the availability of validated stroke assessment scales, there is a gap between what is known (i.e., the importance of using these tools) and what is done in practice. Many neurological physiotherapists are either unaware of these tools or do not use them routinely. Adapting Knowledge to the Local Context involves tailoring stroke assessment tools to fit specific clinical environments, taking into consideration factors such as time constraints, patient population characteristics, and available resources in Nigerian rehabilitation settings. Assessing Barriers and Facilitators to Knowledge Use is a crucial stage where factors that hinder or promote the use of stroke assessment scales are identified. Common barriers include lack of training, unfamiliarity with the tools, insufficient institutional support, and limited access to guidelines. Facilitators may include ongoing professional development, peer mentoring, availability of simplified tools, and supportive workplace policies. Selecting, Tailoring, and Implementing Interventions involves choosing strategies to overcome identified barriers. Examples include conducting workshops, in-service trainings, integrating stroke assessment tools into electronic health records, and using job aids like flowcharts and pocket cards. Monitoring Knowledge Use includes mechanisms to evaluate whether and how stroke assessment scales are being used in clinical practice. This may involve supervisor feedback, self-audits, documentation reviews, and performance evaluations. Evaluating Outcomes assesses the impact of using stroke assessment tools on clinical, professional, and institutional outcomes. Clinical benefits include more accurate diagnosis and better treatment planning. Professional outcomes involve improved clinical reasoning and confidence

among physiotherapists, while institutional outcomes may include enhanced consistency and standardization of care. Sustaining Knowledge Use refers to integrating the use of stroke assessment scales into routine clinical practice, supported by continuous training, updated guidelines, professional advocacy, and institutional policies. This ensures long-term adoption and improved quality of stroke rehabilitation.

The KTA framework is appropriate for this study because it comprehensively captures both the process of acquiring knowledge and the factors influencing its application in clinical practice. It provides a structured lens through which to examine how neurological physiotherapists' transition from knowledge of stroke assessment scales to their actual utilization. Additionally, it highlights the importance of context, system-level support, and continuous monitoring in sustaining clinical improvements.

2.2 Definition

Stroke is characterized by the rapid onset of clinical symptoms indicating either focal or global impairment of cerebral function, persisting for more than 24 hours or resulting in death, with no apparent cause other than a vascular origin (WHO, 1970). It is a vascular condition that leads to brain dysfunction or loss of function in the affected area, caused by cell death due to inadequate blood supply resulting from either an obstruction or rupture of cerebral blood vessels (Waqas et al., 2020). Without timely intervention during the critical "golden hour," the likelihood of mortality increases significantly. Even with appropriate treatment, 70–80% of stroke survivors are left with some form of post-stroke disability (Moon and Keum, 2020). Also referred to as a

cerebrovascular accident (CVA), stroke represents an acute disruption of cerebral blood flow or vascular integrity. Approximately 85% of strokes are ischemic in nature, while the remaining are hemorrhagic (Mozaffarian et al., 2016). According to the American Stroke Association, stroke is defined as permanent damage to brain, spinal cord, or retinal cells due to vascular causes, confirmed through pathological or imaging evidence, regardless of the presence of clinical symptoms (Sacco et al., 2013).

2.3 Epidemiology

Stroke represents a significant and growing global health challenge. It is the leading cause of acquired physical disability among adults worldwide and the second leading cause of mortality in middle- and high-income countries. In 2019, there were 12.2 million incident strokes and 101 million prevalent strokes worldwide. (Yannick, 2022). In these middle and high-income countries, the incidence of ischemic and hemorrhagic stroke has increased over the past decade, ranging from 85–94 cases per 100,000 individuals, with much higher rates (1151–1216 per 100,000) observed in those aged above 75 years. Additionally, 85% of global stroke-related deaths occur in low-income countries, which also account for 87% of stroke-related disability-adjusted life years (DALYs) (Yannick, 2022).

In Nigeria, the most populous black nation, the burden of stroke and other cardiovascular diseases continues to rise due to epidemiological transitions, compounding the existing challenges posed by communicable diseases such as HIV/AIDS, multidrug-resistant malaria, and tuberculosis. This increasing prevalence threatens to further strain the nation’s limited healthcare resources.

Currently, the prevalence of stroke in Nigeria stands at 1.14 per 1000 individuals, with a 30-day case fatality rate as high as 40%. (Onah, 2025)

2.4 Pathophysiology

A cerebrovascular accident (CVA), commonly referred to as a stroke, is characterized by an interruption of blood flow to the brain parenchyma, leading to permanent neurological damage (Dias et al., 2022). Stroke is classified into two main types: and hemorrhagic stroke, caused by bleeding from a ruptured or leaking blood vessel in the brain and ischemic stroke, which occurs due to insufficient blood and oxygen supply to a specific area of the brain (Mir et al., 2014)

i. Hemorrhagic CVA: is characterized by blood vessel rupture, elevates intracranial pressure, and further decreases cerebral perfusion pressure. This induces low oxygen and ATP levels within cells, culminating in cerebral ischemia (Mir et al., 2014).

ii. Ischemic CVA: is caused by occlusion or blockage of blood vessels, either by dislodged emboli from distant sites or in-situ thrombi formed primarily due to atherosclerosis. This reduces cerebral blood flow below 10 mL/100 g/min, leading to irreversible neuronal injury as documented by Mir et al. (2014). Cerebral perfusion pressure also decreases, compromising oxygen and ATP levels within cells, and ultimately triggering cerebral ischemia.

As described by Broughton et al. (2009), both hemorrhagic and ischemic CVAs cause a series of harmful events that include organelle swelling,

disruption of the plasma membrane, and leakage of cellular content into the extracellular space. These events lead to irreversible neuronal injury through a variety of mechanisms, such as nitrosative/oxidative stress, elevated calcium levels, acidosis, ionic imbalance / excitotoxicity, activation of inflammatory pathways, and eventually apoptotic or necrotic cell death within the brain parenchyma (Kuriakose and Xiao, 2020). The ischemic penumbra, surrounding the infarcted core with viable but compromised neuronal tissue, experiences reduced blood flow due to collateral circulation insufficiency: progressive, slow cell death within the penumbra expands the necrotic core, highlighting the importance of therapeutic interventions restoring blood flow to this region for potential tissue salvage (Mir et al., 2014). Consequences of CVA encompass sensory, motor, and cognitive impairments, significantly impacting self-care abilities and social participation, as noted by Mayo et al. (1999).

2.5 Risk Factors

There are two categories of risk factors:

2.5.1 Modifiable Risk Factors

These are factors that can be managed or avoided to lower the risk of an individual experiencing a stroke (Boehme et al., 2017).

i. **Hypertension**: Hypertension stands out as the most crucial modifiable risk factor for stroke, demonstrating a robust and direct correlation with both blood pressure levels and the risk of stroke (Wahab et al., 2017). Sustained elevated blood pressure places undue stress on cerebral

vessels, frequently leading to lacunar infarctions or intracerebral hemorrhage (Pandian et al., 2018).

ii. **Smoking**: This is the most important modifiable risk factor for sub-arachnoid haemorrhage (Wahab et al., 2017). The presence of nicotine and carbon monoxide in tobacco smoke diminishes the oxygen levels in the bloodstream. Quitting smoking reduces the excessive risk, although it does not eliminate it entirely (O'Neill et al., 2003). Smoking doubles the risk of stroke, as it enhances the formation of arteriosclerosis and coagulation factors in the blood (Bhat et al., 2008).

iii. **Obesity**: A higher body weight and obesity are associated with an elevated risk of developing conditions such as high blood pressure, diabetes, and stroke (Onabajo, 2016). Obesity is defined as having a Body Mass Index (BMI) equal to or exceeding 30 Kg/m^2. In Nigeria, the prevalence of obesity is swiftly rising due to a lack of physical activity and an unhealthy diet, consequently heightening the risk of stroke (Komolafe et al., 2015).

iv. **Diabetes Mellitus (DM)**: The presence of DM increases the risk of stroke occurrence by two folds when compared to non-diabetic and one out of every five diabetic patients die from stroke (Pikula et al., 2018). The more common type of diabetes is the type II diabetes which attributes for majority of stroke cases (Olesen et al., 2019). Patients with diabetes suffer from complications like myocardial infarctions and peripheral vascular disease which may eventually lead to stroke (Omotosho et al., 2009).

v. **Physical Inactivity**: Engaging in a sedentary lifestyle heightens the susceptibility to hypertension, diabetes, obesity, and cardiovascular diseases, all of which serve as risk factors for stroke. Elevating physical activity levels could potentially reduce the likelihood of stroke in older adults (Willey et al., 2017). Different types, frequencies and intensities of physical activity have been associated with reduced stroke incidence (Ghozy et al., 2022)

vi. **Hypercholesterolemia**: Cholesterol, a pliable waxy substance present in blood lipids and all body cells, is essential for constructing cell membranes, hormones, and various bodily functions (O'Regan et al., 2008). High levels of serum cholesterol, strongly linked to heightened mortality from ischemic stroke in Western nations (Peters et al., 2013), do not emerge as a notable factor among Africans (Connor et al., 2005).

vii. **Excess Alcohol Consumption**: While alcohol is recognized as a risk factor for stroke, the precise mechanism behind its impact remains uncertain. Certain studies suggest that excessive alcohol consumption triggers the clotting cascade, induces hypertension, and diminishes cerebral blood flow, thereby increasing the vulnerability to thromboembolic stroke (Ifeanyi et al., 2020). Another school of thought asserts that a high to moderate alcohol intake raises the likelihood of developing ischemic stroke, whereas moderate to minimal consumption is not associated with an increased risk of stroke occurrence (Smyth et al., 2023).

2.5.2 Non-Modifiable Risk Factors

Non-modifiable risk factors are characteristics or conditions that an individual cannot change or control.

i. **Age**: The prevalence of stroke risk factors varies across different age groups, potentially stemming from the cumulative impact of age-related changes in the cardiovascular system and the presence of other health conditions. The incidence of stroke doubles approximately every 10 years from the age of 55 (Yousufuddin and Young, 2019). It's important to note that all other stroke risk factors are age-dependent.

ii. Race/Ethnicity: There is a notable discrepancy in the incidence and mortality related to stroke between different racial groups. Blacks, particularly African-Americans, have a higher incidence and mortality compared to Caucasians (Barbhiya et al., 2019). The incidence in African-Americans is approximately twice that of whites, and this difference may be attributed to factors such as lower socioeconomic status, genetic variations, and a higher prevalence of certain other risk factors (Bravata et al., 2015).

iii. **Genetics/Heredity**: While the influence of genetics on stroke was previously unclear, more recent studies indicate that genetic disorders may lead to the manifestation of individual stroke risk factors. A family with previous history of stroke raises the possibility of stroke occurring within the family by 30% (Boehme et al., 2017).

iv. **Sex**: In general, the occurrence of stroke is more common in males across all age brackets. However, at younger ages, the prevalence among women has been observed to be slightly higher, possibly influenced by hormonal changes during pregnancy, post-partum, and the impact of contraceptives on hormones (Boehme et al., 2017). Beyond the age of 30, the risk becomes higher in men and evens out in older ages, potentially linked to longer lifespan or the effects of post-menopause (Rexrode et al., 2022).

2.6 Types of Stroke

2.6.1 Haemorrhagic Stroke

This type of stroke occurs due to the rupture of blood vessels, leading to bleeding and increased intracranial pressure, sometimes presenting as bleeding through orifices (Parmar, 2018). Hemorrhagic stroke accounts for 10% to 20% of stroke cases (Ojaghiaghighi et al., 2017). The incidence of haemorrhagic stroke is around 12% to 15% of cases per 100,000 per year with a high occurrence in low and middle income countries and a global increase in Africa and Asians (Unnithan et al., 2023). The common sites of the bleed are the basal ganglia (50%), cerebral lobes (10% to 20%), thalamus (15%), pons and brain stem (10% to 20%) and the cerebellum (10%), the primary harm results from the hematoma compressing brain tissue and raising intracranial pressure (Chen et al., 2014).

i. Intracerebral Haemorrhage: Involves bleeding and hematoma formation in the brain parenchyma, accounting for 10-15% of all stroke morbidity. Common causes are vascular malformations and changes to blood

vessels due to hypertension and ageing (Rajashekar and Liang, 2022). Common complications include cerebral oedema, elevated intracranial pressure, hydrocephalus, seizures, venous thrombotic events, hyperglycemia, elevated blood pressure, fever and infection (Balami and Buchan, 2012).

ii. Subarachnoid Haemorrhage: Involves bleeding in the subarachnoid space, often presenting with a thunderclap headache. It is caused by intracranial aneurysm and vascular malformation (Ziu et al., 2017). Common complications include: vasospasm, ischemia, re-bleeding, seizure, hyponatremia and hydrocephalus, neurogenic pulmonary edema, an increase in interstitial and alveolar fluid (Al-Dhahir et al., 2023).

2.6.2 Ischemic Stroke

Ischemic stroke results from the blockage of cerebral vessels by plaques or clots. This occurrence can be insidious, with plaques gradually accumulating and reducing blood flow (Sacco et al., 2013). It accounts for over 80% – 87% of stroke (Caplan et al., 2022). Ischemic stroke is categorized into larger vessel stroke (thrombotic and embolic stroke), smaller vessel stroke (Lacunae stroke), and Cardioembolic stroke.

i. Thrombotic Stroke: Most commonly caused by atherosclerosis forming an atheroma on a large cerebral vessel. Fatty streaks deposit on the vessel's lumen in the presence of risk factors such as hypercholesterolemia, progressively narrowing the lumen and reducing cerebral blood flow. Eventually, the atherosclerotic deposit completely

occludes the blood vessel, leading to cell death when cerebral blood flow falls below 10ml/100g/min (Martin and Kessler, 2007).

ii. Embolic Stroke: Results from dislodged emboli originating from a distant site other than the brain's vascular supply. Commonly associated with cardiovascular diseases such as myocardial infarction, dilated cardiomyopathy, atrial fibrillation, or valvular disease. The dislodged blood clot is carried to distant cerebral arteries, blocking a large blood vessel (Martin and Kessler, 2007).

iii. Lacunae Stroke: Arises from occlusion of smaller deep-penetrating branches of cerebral vessels. While often without symptoms, an accumulation of multiple infarcts can result in symptom manifestations (Gore et al., 2020).

2.6.3 Transient Ischemic Attack

While not classified as a stroke, a TIA serves as a warning sign for future stroke. It involves a transient or temporary obstruction of blood flow, presenting with symptoms similar to a stroke but resolving within 24 hours, without signs of focal brain damage or infarction (Panuganti et al., 2022). TIA is like an ischemic stroke without acute infarction. An estimate of 7.5% to 17.4% of patients with TIA will have a stroke in the next 3 months (Mendelson and Prabhakaran, 2021).

2.7 Diagnosis

A review of medical history, coupled with a thorough physical examination and several diagnostic tests, can aid in the diagnosis of a stroke, determining its type, location, and severity (Choi et al., 2022).

i. **Patient history**: Gathering a thorough patient history is crucial for uncovering underlying pathology and guiding clinical decisions. Open-ended questions allow patients to express their thoughts, symptoms, and concerns, providing essential information. Key aspects of history taking include the onset, symptoms, course, duration, associated factors, and the initial response to illness (Nichol et al., 2023).

ii. **Physical examination**: A systematic and continuous process, physical examination involves objectively assessing anatomical deviations. The clinician observes the patient's gait, use of ambulatory aids, orthotic devices, speech, and extremity manipulation. Beginning with observation and followed by palpation, the examination aims to identify signs such as lacerations, redness, swelling, muscle atrophy, asymmetry, and deformities.

iii. **Neurological Assessment**: Neurological assessment evaluates an individual's neurological integrity, covering mental status, cranial nerves, motor coordination, sensory examination, and gait assessment.

iv. **Mental Status Assessment**: Assesses consciousness, alertness, orientation, cognitive ability, memory, speech, and language.

v. **Cranial Nerves Examination**: The evaluation of cranial nerves, an integral aspect of neurological assessment, ensures the proper

functioning of cranial nerves. These nerves, originating from distinct areas of the brain play crucial roles in motor, sensory, and autonomic functions within the head and neck. Any compromise in the associated brain regions can lead to impaired cranial nerve function (Reese et al., 2022).

vi. **Motor Examination**: Assessing muscle integrity and function is central to the motor examination. Overlying muscles are carefully examined for signs of lacerations, bruises, swelling, muscle atrophy, and deformities. Muscle strength and muscle tone testing using the Oxford Muscle Grading System and the modified Ashworth scale (MAS) are some outcome measures used. Additionally, ROM is compared between the affected and unaffected sides.

vii. **Sensory Examination**: This examination involves assessing responses to stimuli, identifying any absent, diminished, exaggerated, or delayed responses. Possible causes include issues with peripheral nerve endings, the spinal cord, tracts, thalamus, brainstem, or cortex (Shahrokhi and Asuncion, 2022). Distinct sensations are classified based on sensory receptors.

- Superficial Sensation: Originating from the environment, these stimuli are detected by exteroceptors, including pain, temperature, and touch. Assessment methods include pin-prick for pain, thermal discrimination testing for temperature, and light touch using the tail end of a cotton swab.

- Deep Sensation: Arising from joints, muscles, ligaments, tendons, and fasciae, responses are elicited by proprioceptors. Kinesthesia, vibration sense, and position sense (proprioception) are evaluated using joint movement tests and Romberg's test.

- Cortical Sensation: Generated from both proprioceptors and exteroceptors, sensations like stereognosis, barognosis two-point discrimination, graphesthesia, recognition of texture, and tactile localization are assessed

viii. **Coordination**: motor coordination through tests like dysmetria and dysdiadochokinesia, evaluating rhythm and rapidly alternating movements.

ix. **Gait**: Begins with the patient's entrance, observing gait abnormalities that may indicate underlying issues. Specific gait patterns, such as high steppage gait, provide insights into potential weaknesses or abnormalities.

x. Radiological Investigations

Neuroimaging is crucial in the assessment of stroke patients, particularly those with acute ischemic stroke. It serves a vital role in distinguishing stroke from other conditions that mimic its symptoms, such as migraine headaches, tumors, seizures, metabolic disturbances, and peripheral or cranial nerve disorders. Additionally, neuroimaging aids in the early detection of hemorrhagic stroke, differentiation between irreversible infarcted tissues and salvageable tissue,

identification of vascular malformations, planning for intravenous thrombolysis and intra-arterial thrombectomy, and predicting outcomes (Hand et al., 2006).

Radiological imaging is crucial for diagnosing strokes and guiding treatment decisions as it provides an objective basis for stroke diagnosis (Birenbaum et al., 2011). Common techniques include Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasonography, and Angiography.

xi. Laboratory Investigations

Laboratory investigations are a good tool for diagnosing stroke and ruling out other conditions as well as guiding treatment choices. Some of these laboratory tests include:

- Full Blood Count (FBC): This involves assessing platelet levels, crucial for blood clotting. The examination also includes measuring electrolyte levels to evaluate kidney function.

- Coagulation Assessment: Through tests like Prothrombin Time (PT) and Partial Thromboplastin Time (PTT), the rate of blood clotting can be determined. Prolonged clotting time may indicate potential bleeding issues.

2.8 Management of Stroke

2.8.1 Medical Management of Stroke

Management of Ischemic Stroke:

In cases where imaging reveals no hemorrhage, the approach to ischemic stroke management involves several key strategies like thrombolytic therapy, anticoagulant and antiplatelet therapy (Sheth and Ciccone, 2025).

Management of Hemorrhagic Stroke:

If imaging indicates hemorrhage, the management strategies differ, it includes coagulate and thrombocytopenia – related haemorrhage (ICH) and Warfarin related ICH for cardioembolic cerebral infarction. (Sheth and Ciccone, 2025)

2.8.2 Surgical Management

This involves the management of stroke through surgical procedures. Some of these processes include simple and complex Intracranial bypass, Aneurysm Clipping, stereotactic radiosurgery, Coil Embolization, Thrombectomy, Ventriculostomy, Surgical Removal of Pooling Blood, hemispheric decompression, carotid endarterectomy for aneurysm and arteriovenous malformation, endovascular surgery and Suboccipital Craniotomy (Feigin et al., 2016).

2.8.3 Physiotherapy Management

An all-encompassing rehabilitation regimen is crucial for maximizing post-stroke results. Rehabilitation employs three key recovery principles: adaptation, restitution, and neuroplasticity (Belagaje, 2017). Utilizing these principles, diverse approaches exist to augment rehabilitation. Physiotherapists contribute greatly to stroke rehabilitation. Successful rehabilitation entails a comprehensive understanding of the natural progression of stroke recovery and a multidisciplinary strategy, prudently allocating resources to recognize and

address prevalent post-stroke consequences (Belagaje, 2017). Currently, the Bobath Approach, rooted in neurophysiological principles, likely stands as the most extensively employed method in the Western hemisphere (Vaughan and Wright, 2015). Other physiotherapy management procedures for the rehabilitation of stroke patients include: Brunnstrom approach, body positioning, balance and gait training, treadmill training, Functional Electrical Stimulation (FES), virtual reality, progressive ambulation, use of orthotics, strengthening exercises, Constraint Induced Movement Therapy (CIMT), robot assisted arm training, mirror therapy, splinting, cardiorespiratory exercises, hydrotherapy, stretching exercises among others which must be grounded on practical clinical reasoning and evidence based practice (Veerbeek et al., 2014).

2.9. Stroke Assessment Scales

Stroke assessment scales are standardized scales use for diagnostic, therapeutic, prognostic and care implication purposes. They have proven to be very useful for assessing and guiding decisions in acute management and rehabilitative treatment. They are also used in clinical practice to measure acute neurological deficits and functional outcome in stroke.

A study by Caneda (2014) outlined the characteristics of a stroke clinical scale of evaluations. They include:

i. Reliability: is a measure of consistency in the score obtained from its ability to reproduce the similar or same scores or results when subject to same evaluator with the least possible variations. . Using the κ coefficient, this is quantified as inter-rater or inter-observer reliability. The following scale can be used to interpret the level of inter-rater

agreement determined by the kappa statistic: less than zero indicate poor agreement, 0 – 0.20 indicates mild agreement, 0.21 – 0.40 indicate reasonable agreement, 0.41 – 0.60 indicate moderate agreement, 0.61 – 0.80 indicate substantial agreement and 0.81 – 1.00 indicate nearly perfect agreement.

ii. Validity: is an essential characteristic of an effective scale, though may be challenging to evaluate. Validity my refer to: criterion validity –the ability of the scale to accurately assess a patient's clinical status or predict outcomes; Content validity – the extent to which the scale comprehensively captures all relevant dimensions of the condition being measured; Concurrent validity – the degree of correlation with other established measurement tools.

iii. Specificity: Components included in the scale should be chosen based on their diagnostic value. They should occur with sufficient frequency and have proven prognostic significance.

iv. Efficiency: To effectively detect abnormalities at any stage of a disease, the scale should qualify and quantify neurological sign and symptoms.

v. Responsiveness to change: the scales should be able to fluctuate to detect clinical changes over time.

An ideal scale would be simple and efficient to administer, well accepted by patients and researchers and demonstrate validity, reliability and sensitivity to clinically meaningful changes. However no existing stroke measure fully meets all these criteria and it is unlikely that any single tool ever will. There remains no consensus on the most appropriate stroke assessment scale to use. (Harrison, et al., 2013).

Here are some of these stroke assessment scales:

2.9.1 Face, Arms, Speech, Time (FAST) and Balance, Eyes, Face, Arms, Speech, Time (BE-FAST).

This is a stroke recognition scale that focuses on facial asymmetry, arm weakness, speech difficulties and time to call emergency services. It helps in identifying acute stroke (Fassbender et al., 2020). It has proven effective in prompting emergency call with high public recall. The FAST scale has been found to miss 14% of strokes, especially posterior circulation stroke e.g. , balance and vision issues (Rund et al., 2016). To use the FAST scale, the following are looked out for: Face drooping; does one side of the face droop or is it numb. Is the patients' smile even or is it lopsided. Arm weakness; is one arm weak or numb. Is the patient able to lift both arms without assistance? Speech; is the patients' speech slurred. Is the patient unable to speak or finds it hard to understand Time; the patient should receive medical attention as soon as possible, act fast.

The modified version of the FAST scale is the BE-FAST scale. Added to the original scale is balance loss and vision disturbances to address posterior stroke. This has reduced the amount of missed strokes by 4% by accounting for posterior symptoms like vertigo, diplopia. It is 97.8% more sensitive for posterior circulation as against 58.7% with the FAST scale. There is reduced specificity with this scale (El Ammar et al., 2020).

The FAST scale has remained favoured for rapid public education due to its simpler acronym improving long term retention of core symptoms.

2.9.2 The National Institutes of Health Stroke Scale (NIHSS)

The NIHSS is a 15 – item impairment scale designed to measure stroke severity. It was originally developed in 1989 and is a valid, responsive and dependable instrument that can be used in both clinical setting and research. The NIHSS is a composite scale derived from the Oxbury Initial Severity scale, the Toronto Stroke Scale, the Cinccinnati Stroke scale and the Edinburgh-2 Coma scale (Makharia et al., 2024). It is also recommended by the National Stroke Foundation as a reliable scale for evaluating stroke severity in emergency. The NIHSS assesses multiple neurological domains including: level of consciousness, eye movements, integrity of visual fields, facial movements, arm and legs muscle strength, sensation, coordination, language, speech and attention. Each area is scored on an ordinal scale ranging from 0 to 2, 0 to 3 or 0 to 4. Item scores are summed to a total score of 42 (the higher the number, the more severe the neurological disorder) (Zhou et al., 2021). It assesses the body function and structure domain of the WHO ICF model. The original 15 – item NIHSS remains the most common although several modified versions have been developed and are available in many languages to improve accessibility and ease of use in different settings. It takes less than ten minutes to conduct and requires very little equipment – just a sharp item (like a pin) is needed for the sensation test. The intended population for the use of NIHSS are acute stroke patients. It has been demonstrated to predict both short and long term outcomes in stroke patients. It is very useful for early prognostication assessment (Zhou et al., 2021). Stroke severity may be categorized on the

basis of NIHSS scores as: Very severe (> 25), severe (15 – 24), mild to moderately severe (5 – 14), mild (1 – 5).

Individual NIHSS elements have been demonstrated to have striking inter-rater reliability. However, overall score can be variable thus sufficient training is essential to apply the NIHSS accurately (Runde, 2020). In a study to find out the reliability of NIHSS between emergency room and neurology physicians with a population of 129 stroke patients, the intraclass correlation coefficient (ICC) or κ value was 0.95. Overall reliability was excellent between them (Cummock et al., 2023). According to a study of 340 selected patients in the emergency department, weighted Kappa statistics revealed that language and LOC questions had great agreement (κ = 0.7) the components of gaze, visual fields, ataxia, sensory and extinction had weak agreement (κ > 0.4) and the remaining component had moderate agreement . For the entire NIHSS, the ICC between the neurologist and the ED doctors was 0.82 (Katz et al., 2015).

Some common pitfalls recognized in use of this scale include:

Zero NIHSS stroke is when stroke patients with evident signs and symptoms of impairment get an NIHSS score of zero. Hence an NIHSS score of zero does not mean that a stroke has not occurred in the patient. It has been proven that deficiencies resulting from lesions in the anterior circulations such as those affecting motor function and cortical signals are disproportionately favoured by this scoring method. Conversely, because of co-occurrence of motor deficits, posterior circulation deficits like ataxia and anomalies of the cranial nerves are given less points or may even be

disqualified from scoring. To combat this limitation, many researchers have introduced the expanded version of NIHSS score which is the POST-NIHSS (Olivato et al., 2016).

The cultural relevance of the language component in the NIHSS can differ across diverse populations. It was originally developed in English for the western population. To enhance its applicability, various countries have adapted and validated culturally and linguistically appropriate versions of the NIHSS. Some of these languages include Hindu, Chinese, German, Spanish, Italian etc. (Berube et al., 2019).

2.9.3 Fugl-Meyer Assessment scale (FMA)

The FMA is a performance based impairment score that is unique to stroke. The scale was first proposed in 1975 by Axel Fugl-Meyer and his colleagues as a standardized assessment test for post stroke recovery in their paper titled 'The post stroke hemiplegic patient: a method for evaluation of physical performance.' It is intended to evaluate patients with post stroke hemiplegia of all ages. It is used in research and clinical settings to characterize motor recovery, plan and evaluate treatment, and measure the severity of the disease. It takes about 40 - 60 minutes to administer the total FMA (Margit, 2024). It assesses the body function and structure domain of the WHO ICF model. The FMA utilizes an ordinal scale to evaluate motor function, with most items rated on a three point system. A score of 0 is assigned when the individual is unable to perform the task, 1 when it is partially completed and 2 when the task is fully executed. An exception to this scoring system is the assessment of reflex activity, which

is evaluated on a two point scale: a score of 0 indicates the absence of reflexes, while a score of 2 denotes their presence (Huynh et al., 2023). The scale is made up of five domains and there are 155 items in total. The domains are:

i. Motor functioning: is tested in the upper and lower limbs. The motor score ranges from 0 (hemiplegia) to 100 points (normal motor performance). It is divided into 66 points for the upper limb and 34 points for the lower limb.
ii. Sensory functioning: evaluates light touch on two surfaces of the arm and leg and proprioception for 8 joints. It ranges from 0 to 24 points. It is divided into 8 points for light touch and 16 points for proprioception.
iii. Balance: The test consist of 7 tests, 3 seated and 4 standing. It ranges from 0 to 14 points. It is divided into 6 points for sitting and 8 points for standing
iv. Joint range of motion: assesses across 8 joints. It ranges from 0 to 44 points
v. Joint pain: ranges from 0 to 44 points

One major limitation of the FMA is that it is a long measure to administer taking up a lot of time. Hence in clinical setting, the scale is often divided focusing on the areas the physician decides is most relevant to the patient's case e.g. upper extremity FMA.

In a study to investigate the inter-rater of the FMA scored by a physiotherapist and a physician using video recording of 50 post stroke

patients; ICC was 0.98. The inter-rater reliability at the item level of the FMA showed kappa value of 0.69 (Wiesner et al., 2024). Another study to show the validity of the official version of the FMA was done, Each of the motor items had a high degree of agreement, with scores significantly higher than 70%. Six items in the sensory, joint range and pain domains as well as one reflex item showed disagreements. The final Italian version was established by discussing and revising items that showed conflicts (Cecchi et al., 2020).

2.9.4 Modified Ashworth Scale

The most popular clinical instrument for assessing elevated muscle tone is the Modified Ashworth Scale (MAS) (Meseguer et al., 2018). It assesses the body function and structure domain of the WHO ICF model. As a component of upper motor neuron syndrome, spasticity was described by Jim Lance in 1980 as a velocity dependent increase in muscular stretch reflexes linked to increased muscle tone (Emos., 2023). According to a study looking at the prevalence of spasticity among stroke patients, 42.6% experience spasticity with severe cases occurring in 15.6% of patients (Harb et al., 2025).

Bryan Ashworth developed the Ashworth Scale in 1964 as a way to rate spasticity in people with multiple sclerosis. A 5-point numerical scale with 0 denoting no resistance and 4 denoting a limb that was rigid in flexion or extension, was used to evaluate spasticity in the original ashworth scale. In order to improve sensitivity, Bahanon and smith added 1+ to the Ashworth scale in 1987 while conducting a research to investigate the interrater

reliability of manual examinations of elbow flexor muscle spasticity. The MAS has been used to measure spasticity in clinical practice and research ever since it was modified (Harb et al., 2025). The scale is as follows:

0: No increase in muscle tone

1: Slight increase in muscle tone, with a catch and release or minimal resistance at the end of the range of motion when an affected part(s) is moved in flexion or extension

1+: Slight increase in muscle tone, manifested as a catch, followed by minimal resistance through the remainder (less than half) of the range of motion

2: A marked increase in muscle tone throughout most of the range of motion, but affected part(s) are still easily moved

3: Considerable increase in muscle tone, passive movement difficult

4: Affected part(s) rigid in flexion or extension

Although MAS's reliability has been thoroughly investigated, the results have been varied. It has been noted that the scale's inter rater reliability varies considerably according to the muscle group being evaluated, the examiner's background and the methodological irregularities in the scale's use. For some muscle groups, such as elbow flexors, the MAS showed comparatively good inter rater agreement; however, for other muscle groups, including the lower limb musculature, the reliability was lower (Zurawski., 2019). The reliability of the MAS is also threatened by the lack of uniformity in how it is administered. The pace of passive movement is a

major source of variability since spasticity depends on velocity, but there are no hard and fast rules on the ideal speed for manipulating limbs. Examiner experience and training are also important factors, physicians with more expertise show higher intra-rater reliability than those with less Mas exposure. Furthermore, muscle tone and perceived resistance are impacted by patient placement, which might result in inconsistent grading (Gal et al., 2025). The MAS's decreased sensitivity to identifying variation in spasticity with time is a significant drawback. It is challenging to evaluate therapy outcomes, especially for small improvements, because the scale's 0-4 grading system does not permit nuanced distinction in incremental changes. For example, there are only weak associations between changes in MAS scores and real functional gains in trials assessing how sensitive MAS is to pharmaceutical or rehabilitative therapy (Hugos, 2019).

2.9.5 Barthel index (BI)

The Barthel index is the most popular test for evaluating functional dependency for activities of daily living (ADL). The original scale was published in 1965. The index measures a person's degree of functional dependency and is made up of ten basic everyday life activities including feeding, bathing, grooming, dressing, bowel, bladder, toilet use, transfer bed to chair and back, mobility on level surface, and stair negotiation. It takes about 2 – 5 minutes to administer. It assesses the activities and participation domain of the WHO ICF model. Each item is graded according to the person's ability to complete an activity or task on their own, with help or completely dependent. The following are the scoring: 0

denoted inability, 1 denotes need for assistance and 2 denotes independence. To determine the final score out of 100, the sum of the ten items is multiplied by 5. The following are suggested rules for interpreting Barthel scores. Scores between 0 and 20 represent total dependency, 21 to 60 represents severe dependency, 61 to 90 represent moderate dependency, and 91 to 99 represent slight dependency. The majority of research set a cutpoint of 60/61 (moderate reliance) (Martins et al., 2024)

There have been suggestions for changes to the Barthel index over time. Granger in 1989 expanded the number of activites assessed to 15 in his proposal establishing two distinct indices; one for mobility and one for self care. Also Shah in 1989 expanded the number of response alternatives for each of the ten assessed activities in his suggestion He changed the scoring scale to five-point rating scale to improve reliability and responsiveness to change. Beyond its original purpose of evaluating functional capacity, the BI has shown itself to be a valuable tool for patients' evaluation. The likelihood of hospital admission, surgical complication and hospital discharge complications, can all be accurately predicted by the BI score. When it comes to predicting the risk of complications in many medical procedures that do not necessitate hospitalization, predicting the onset of long term frailty and making decisions regarding institutionalization, the BI is also a good indicator of risk outside of the hospital setting (Martin et al., 2024). In a study to find the psychometric validation using Item Response Theory (IRT) in 1402 chinese nursing home residents, bowel and bladder control items showed redundancy, combining them improved scale fit. The modified BI demonstrated high reliability and precision for moderate

functional impairment. The BI fails to capture environmental factors e.g., home adaptation and may lack precision in severe disability (Liang et al., 2024).

2.9.6 Functional Independence Measure (FIM)

The Functional Independence Measure (FIM) was developed between 1984 and 1987 by a national task force sponsored by the American Academy of Physical Medicine and Rehabilitation and the American Congress of Rehabilitation Medicine. It assesses the activities and participation domain of the WHO ICF model. It was designed to provide a uniform system for measuring disability that was more sensitive and comprehensive than its predecessor, the Barthel Index (Zeltzer, 2011). Its fundamental purpose is to assess a patient's functional abilities and to quantify the "burden of care," which is the level of assistance a person requires to perform essential daily activities (Lasky and Jack, 2023). This focus has made the FIM an indispensable tool in inpatient rehabilitation, guiding goal setting, tracking progress, and informing administrative decisions regarding resource allocation and payment systems (Lasky and Jack, 2023). The FIM is structured as an 18-item observational scale divided into a 13-item Motor Domain (covering self-care, sphincter control, transfers, and locomotion) and a 5-item Cognitive Domain (assessing communication and social cognition) (Lasky and Jack, 2023). Administration must be performed by trained and certified clinicians, typically through direct observation within 72 hours of admission and again before discharge, taking about 30 minutes to complete (Hebert et al., 2016; Lasky and Jack, 2023). Each item is scored on a 7-point scale reflecting the level of assistance needed, from 1

(Total Assistance) to 7 (Complete Independence). The total FIM score ranges from 18 to 126, with higher scores indicating greater functional independence and a reduced burden of care (SCIRE, 2020; Lasky and Jack, 2023).

Interpreting FIM scores is critical for predicting outcomes and measuring progress. Patients with high scores (e.g., >80) are very likely to return home, while those with low scores (e.g., <40) are often discharged to long-term care facilities (Bottemiller et al., 2006). A change in the total FIM score of 22 points is considered a Minimal Clinically Important Difference (MCID), representing a meaningful improvement for the patient (SCIRE, 2020). The measure has demonstrated high reliability when used by trained evaluators (ICC = 0.96) and strong validity through its high correlation with other functional scales like the Barthel Index (Hsueh et al., 2002; SCIRE, 2020). However, the FIM's predictive power is less certain for scores in the 40-79 midrange, a group that makes up about half of the stroke rehabilitation population. This "midrange problem" should not be seen as a limitation but as a call to action, signaling that these patients have high rehabilitation potential where intensive therapy can be the decisive factor in their discharge disposition (Bottemiller et al., 2006). The FIM's dual role as a clinical and administrative tool, influencing both patient care plans and facility reimbursement rates, underscores the absolute necessity for rigorous training and accurate scoring (Buchanan et al., 2003).

2.9.7 Modified Rankin Scale (mRS)

The Modified Rankin Scale (mRS) is a global outcome measure used to classify the degree of disability or dependence in daily activities for individuals who have had a stroke (Physiopedia, 2024). Originally developed by Dr. John Rankin in 1957, it was later modified to its current 7-level (0-6) format and has become the most widely used clinical outcome measure in large-scale stroke trials worldwide due to its simplicity (Banks & Marotta, 2007; Zeltzer, 2008). The mRS is a single-item ordinal scale that assesses functional independence by referencing a patient's pre-stroke activities, thus capturing elements from the ICF domains of Activity and Participation (Zeltzer, 2008). Administration involves a guided interview with the patient or a proxy, taking less than five minutes, where the clinician integrates information about daily living with findings from the neurological exam to assign a single grade from 0 (No symptoms) to 6 (Dead) (Zeltzer, 2008; Physiopedia, 2024). In clinical trials, the scale is often dichotomized to define a "good functional outcome" (mRS 0-2) versus a "poor functional outcome" (mRS 3-6) to determine an intervention's efficacy, though analyzing the full ordinal scale is becoming more common for a nuanced assessment (Broderick et al., 2017).

The primary challenge of the mRS is its reliability. Without a standardized process, inter-observer reliability is often only moderate, with kappa coefficients ranging from 0.25 to 0.74 due to the subjective nature of its grade definitions (Zeltzer, 2008; Quinn et al., 2009). However, this can be substantially improved with the use of structured interviews and formal training, which can yield excellent inter-rater reliability (weighted κ up to 0.99) (Quinn et al., 2009; Broderick et al., 2017). In contrast, its validity is strong, with scores correlating well with stroke pathology, other disability scales like

the FIM, and long-term outcomes (Broderick et al., 2017; Physiopedia, 2024). The paradox of the mRS is that its simplicity, which makes it ideal for large trials, is also the source of its reliability issues. This has led to a significant push for standardized administration protocols, recognizing that the rigor of the assessment process is inextricably linked to the value of the resulting score (Zeltzer, 2008; Quinn et al., 2009).

2.9.8 Berg Balance Scale (BBS)

The Berg Balance Scale (BBS) was developed in 1989 by Katherine Berg and colleagues as a quantitative, performance-based measure of balance in older adults to assess fall risk (Zeltzer and McDermott, 2010; Miranda & Tiu, 2023). It has since been extensively validated and is now one of the most widely used tools for assessing balance in stroke survivors. The BBS consists of 14 performance-based tasks that progress in difficulty, evaluating both static and dynamic balance within the ICF 'Activity' domain. These tasks, which include activities like standing from a seated position, turning 360 degrees, and standing on one leg, are designed to mimic real-life movements (Miranda & Tiu, 2023; Joa, 2024). Administering the BBS takes 15 to 20 minutes and requires simple equipment like a chair and a stopwatch, with no specialized training needed beyond familiarity with the scoring criteria (Zeltzer and McDermott, 2010). Each item is scored on a 5-point ordinal scale (0-4), where 0 indicates the lowest function and 4 indicates the highest. The scores are summed to a total out of 56, with higher scores indicating better balance (Wang et al., 2024).

Interpretation of the BBS is guided by established cut-off scores that classify fall risk: 0-20 indicates a high risk, 21-40 a medium risk, and 41-56 a low risk (Zeltzer and McDermott, 2010). A score below 45 is often used as a threshold for an increased risk of falling in stroke survivors (Physiopedia, 2025b). The scale has outstanding reliability, with excellent inter-rater and test-retest reliability (ICC = 0.98), as well as strong validity as a unidimensional measure of balance (Miyata et al., 2022; Joa, 2024). Its most significant limitation, however, is a susceptibility to ceiling effects in higher-functioning patients and floor effects in a severely affected patient, meaning it may not be challenging enough to detect changes at the extremes of ability (Zeltzer and McDermott, 2010). This positions the BBS as an effective "mid-recovery" tool, excellent for tracking progress through intermediate stages of rehabilitation. Once a patient masters the tasks, clinicians must supplement the BBS with more challenging assessments to accurately evaluate high-level balance and ensure interventions are appropriately targeted for a safe return to the community.

2.9.9 The 10-meter Walk Test (10MWT)

The 10-meter Walk Test (10MWT) was developed by Collen and colleagues in 1990 (Klenow and Klenow, 2023). It is a simple and efficient performance-based measure used to assess walking speed over a short distance, a metric so predictive of health status that it has been called the "sixth vital sign" (Physiopedia, 2025a). As a direct measure within the ICF 'Activity' domain, the standard protocol involves timing an individual over the central 10 meters of a 14-meter walkway to allow for acceleration and deceleration. The test is typically performed under two conditions: comfortable gait speed and fast gait

speed (Moore et al., 2018; Physiopedia, 2025a). To score the test, the distance (10 meters) is divided by the average time in seconds, yielding a speed in meters per second (m/s). Gait speed is a robust indicator of functional independence, with established cut-off scores for the stroke population: <0.4 m/s classifies an individual as a household ambulator, 0.4-0.8 m/s as a limited community ambulator, and >0.8 m/s as a full community ambulator (Moore et al., 2018; Klenow and Klenow, 2023).

The responsiveness of the 10MWT is well-documented; for subacute stroke, the Minimal Clinically Important Difference (MCID) is reported as 0.16 m/s (Klenow and Klenow, 2023). However, the Minimal Detectable Change (MDC) is highly dependent on the patient's initial ability, being much smaller for very slow walkers than for fast walkers (Hosoi et al., 2023). The test demonstrates excellent reliability (ICC > 0.94) and validity, correlating strongly with measures of endurance, functional mobility, and independence (Cleland et al., 2020; Klenow and Klenow, 2023; Physiopedia, 2025a). The designation of gait speed as a vital sign reflects its power as a proxy for overall health, as walking requires the integration of multiple body systems (Klenow and Klenow, 2023). For physiotherapists, this makes the 10MWT a powerful tool for classifying function, setting tangible goals, and tracking progress. However, its simplicity belies the need for standardized administration and nuanced interpretation, as minor protocol variations can affect results, and the significance of a change in speed must be interpreted relative to the patient's baseline functional level (Hosoi et al., 2023; Physiopedia, 2025a).

2.9.10 The 6-minute Walk Test (6MWT)

The 6-minute Walk Test (6MWT) is a practical, submaximal exercise test designed to assess functional walking endurance and cardiorespiratory capacity, offering a reflection of the ability to perform daily activities that require stamina (ATS, 2002; Hamidzadeh and Zeltzer, 2011). First described by Butland et al. in 1982, its safety and strong psychometric properties have led to its wide adoption in stroke rehabilitation. The 6MWT is a performance-based measure within the ICF 'Activity' domain, and its standardized protocol, outlined by the American Thoracic Society, is crucial for reliable results. The test requires a 30-meter flat, indoor corridor, and the patient is instructed to walk as far as possible in 6 minutes, with standardized encouragement from the clinician. The final score is the total distance walked in meters (ATS, 2002; Hamidzadeh and Zeltzer, 2011). A greater distance indicates better functional exercise capacity, and a change of 30 to 45 meters is considered a Minimal Important Difference (MID) (Physiopedia, 2025c).

The 6MWT has excellent test-retest reliability in stroke populations (ICC = 0.99) and demonstrates strong concurrent validity with other key mobility measures, including fast gait speed (r = 0.94) and the Timed Up and Go test (r = -0.89) (Physiopedia, 2025c). The fundamental distinction between the 6MWT and the 10MWT is the construct being measured: the 6MWT assesses endurance, not just speed (Hamidzadeh and Zeltzer, 2011). This makes it a more ecologically valid assessment for many real-world activities, such as grocery shopping, that require sustained walking. A patient may have a normal gait speed on the 10MWT but be severely limited by fatigue, a limitation the 6MWT is specifically designed to unmask. For physiotherapists, a low score on the 6MWT is a clear indicator that a patient may not be ready for the demands

of independent community life, providing vital information to guide endurance-based training programs and manage expectations for recovery.

2.9.11 Stroke Impact Scale (SIS)

The Stroke Impact Scale (SIS) is a comprehensive, self-report questionnaire developed to assess the multidimensional impact of stroke on an individual's quality of life from the patient's point of view (Michaelsen and Rodrigues, 2024). A defining feature of the SIS is that its items and domains were derived directly from focus groups with stroke survivors and their caregivers, ensuring it measures outcomes that are truly meaningful to patients (Mulder and Nijland, 2016). The current version, SIS 3.0, contains 59 questions organized into eight distinct domains that span the ICF model: Strength, Memory and Thinking, Emotion, Communication, Activities of Daily Living/Instrumental Activities of Daily Living (ADL/IADL), Mobility, Hand Function, and Participation/Role Function (Duncan et al., 1999). It also includes a single question where patients rate their overall recovery on a scale of 0 to 100. The SIS is typically administered as a structured interview, taking 10 to 15 minutes, which is important for patients with communication or cognitive impairments (Mountain et al., 2020; Michaelsen & Rodrigues, 2024). For each of the eight domains, a standardized score from 0 to 100 is calculated, where 100 represents no perceived impact from the stroke (Michaelsen & Rodrigues, 2024).

The SIS has demonstrated strong psychometric properties, with high internal consistency (Cronbach's α = 0.83-0.90) and good to excellent test-retest reliability for most domains (Duncan et al., 1999). Its validity is also strong, as

its domain scores discriminate well between different levels of disability and correlate moderately to strongly with corresponding subscales of other established measures (Duncan et al., 1999). The true clinical power of the SIS lies in its multi-domain structure, which provides a holistic "dashboard" of recovery from the patient's perspective. It allows clinicians to create a detailed profile of challenge and strength, moving the therapeutic conversation beyond physical function to address the real-world barriers to a meaningful recovery (Michaelsen and Rodrigues, 2024). A patient may score highly on mobility but very low on participation, a discrepancy that the SIS can reveal, prompting investigation into underlying causes like depression or lack of confidence. While its comprehensive nature can be a challenge in time-pressured settings, validated shorter versions, like the SIS-16 and an 8-item short form, offer a pragmatic compromise between data richness and clinical feasibility (MacIsaac et al., 2016; Michaelsen and Rodrigues, 2024).

2.9.12 Stroke-Specific Quality of Life Scale (SS-QoL)

The Stroke-Specific Quality of Life Scale (SS-QoL), developed by Williams and colleagues in 1999, is a patient-reported outcome measure designed to efficiently assess the multiple domains that determine health-related quality of life (HRQOL) for stroke survivors (Odetunde, 2010). Similar to the SIS, the SS-QoL's development was patient-centered, with its domains generated from qualitative interviews with stroke survivors who identified the life areas most impacted by their stroke, such as language, use of the paretic arm, and family roles. This "bottom-up" methodology ensures the scale possesses exceptional content validity and measures concepts that are directly relevant to patients

(Odetunde, 2010). The final version consists of 49 items across 12 distinct domains, including Energy, Family Roles, Language, Mobility, Mood, Personality, Self-Care, Social Roles, Thinking, Upper Extremity Function, Vision, and Work/Productivity. This versatile instrument can be administered via interview or as a self-report questionnaire, typically taking 10 to 15 minutes to complete (Odetunde, 2010; Mountain et al., 2020).

Scores can be calculated for each of the 12 subscales or summed for a total score ranging from 49 to 245, with higher scores consistently indicating a better stroke-specific quality of life (Mountain et al., 2020). The SS-QoL has demonstrated excellent psychometric properties, including strong internal consistency across all domains (Cronbach's $\alpha \geq 0.73$) and good construct validity, with scores correlating well with other established measures like the SF-36 health survey and the Barthel Index (Odetunde, 2010). It has also been shown to be sensitive to changes in patient status over time. The patient-centered foundation of the SS-QoL means that clinicians can be confident the questions resonate with the patient's lived experience, which not only yields more valid data but can also enhance the therapeutic alliance by demonstrating that the patient's unique perspective is valued (Odetunde, 2010).

2.9.13 Assessment of Life Habits (LIFE-H)

The Assessment of Life Habits (LIFE-H) is a questionnaire designed to measure the quality of social participation by assessing the accomplishment of daily activities and social roles within a person's real-world environment (Figueiredo, 2008). Developed by a Canadian research group, its conceptual foundation is the Disability Creation Process (DCP) model, which posits that

disability results from the interaction between personal impairments and environmental factors, making it highly congruent with the ICF framework (Desrosiers et al., 2004). The LIFE-H is organized into 12 domains of life habits, categorized as either Current Activities (e.g., nutrition, mobility) or Social Roles (e.g., responsibilities, community life), with long and short forms available for detailed or global assessment (Figueiredo, 2008; INDCP, 2017). Administration is flexible—it can be self-reported or interviewer-led—and for each life habit, it uniquely assesses the level of accomplishment, the type of assistance required, and the individual's level of satisfaction (Fougeyrollas and Noreau, 1998; Desrosiers et al., 2004). A unique algorithm combines difficulty and assistance scores into a single 0-9 accomplishment score, where 9 indicates optimal social participation (Desrosiers et al., 2004).

The LIFE-H has demonstrated moderate to high reliability and good construct validity in stroke populations, with scores correlating significantly with the Barthel Index and the SS-QoL (Fougeyrollas and Noreau, 1998; Albishi et al., 2025). The tool's unique strength is its rigorous operationalization of the distinction between 'Activity' (what a person *can* do in a clinical setting) and 'Participation' (what they *actually do* in their community) (Figueiredo, 2008). By assessing performance in a real-world context and including a satisfaction scale, it is specifically designed to capture the "performance gap" that may exist due to environmental, social, or personal barriers. This makes the LIFE-H an indispensable tool for community-based rehabilitation and discharge planning, as it shifts the therapeutic focus from simply restoring function to enabling the resumption of meaningful life roles and compels the healthcare

system to consider the environmental and psychosocial components of a recovery plan.

2.9.14 Mini-Mental State Examination (MMSE)

The Mini-Mental State Examination (MMSE) was developed by Molly and colleagues in 1991 (Molly et al., 1991). It was designed as a brief, quantitative screening tool to help clinicians grade the severity of cognitive impairment and monitor changes over time (Vertesi et al., 2001). It is essential to recognize that the MMSE is not a diagnostic tool but a screener to determine if more comprehensive evaluation is warranted (Alexandra. et al., 2019). The 30-point questionnaire assesses seven cognitive domains, including orientation, registration, attention, recall, and language, and takes approximately 5 to 10 minutes to administer (Molloy and Standish, 1997; Zeltzer, 2010). A score below 24 is often used as a cut-off to suggest cognitive impairment, but this is an oversimplification, as scores are profoundly influenced by an individual's age and level of education, which can lead to significant misclassification if not considered (Molloy and Standish, 1997; Zeltzer, 2010). For stroke patients, a score of 26/27 may predict moderate cognitive deficits, while 23/24 is more predictive of dementia (Bour et al., 2010).

In the stroke population, the MMSE is considered a "blunt instrument" with limited validity for detecting the specific cognitive deficits common after a stroke, such as problems with executive function (Zeltzer, 2010). It has low sensitivity for mild cognitive impairment and for deficits resulting from right-hemisphere lesions. In fact, one study found that 67% of stroke patients who scored in the "normal" range on the MMSE were found to have cognitive

deficits when tested with the more sensitive Montreal Cognitive Assessment (MoCA) (Zeltzer, 2010). A physiotherapist who relies on a "normal" MMSE score as definitive proof of intact cognition risks making a critical clinical error by overestimating the patient's capacity for new learning. The evidence strongly suggests that for the stroke population, the MMSE should be either replaced by or supplemented with a more sensitive tool like the MoCA, and a "normal" MMSE score should never preclude a referral for full neuropsychological assessment if cognitive concerns exist (Zeltzer, 2010).

2.9.15 Benin Stroke Score (BSS)

The Benin Stroke Score (BSS) is fundamentally a simple clinical diagnostic tool. Developed in a low-resource setting, its specific purpose is to help clinicians differentiate between ischemic stroke and intracerebral hemorrhage when gold-standard neuroimaging like a CT or MRI scan is unavailable (Aiwansoba et al., 2014). The score is calculated at the bedside based on three clinical variables: age, supine diastolic blood pressure, and the Glasgow Coma Scale (GCS) score. The points are summed to a total ranging from 0 to 3.5. A total score of ≤ 2.5 is considered diagnostic for an acute brain infarct (ischemic stroke), while a score > 2.5 is suggestive of an intracerebral hemorrhage (Aiwansoba et al., 2014). This differentiation is critical for acute medical management, as giving anticoagulant medications to a patient with a brain bleed can be catastrophic.

The BSS has shown high inter-rater reliability and, when compared against neuroimaging for diagnosing brain infarcts, a sensitivity of 83.78% and a specificity of 69.56%, indicating an appreciable level of accuracy for its

intended purpose (Aiwansoba et al., 2014). Its inclusion in this report serves primarily to correct any misunderstanding of its function. The BSS has no role in the ongoing functional assessment of a patient during physiotherapy rehabilitation; it is a tool for acute medical diagnosis, developed to fill a dangerous diagnostic gap in settings without immediate access to technology (Chukwuonye et al., 2015). It must be distinguished from excellent rehabilitation outcome measures also developed by researchers in Benin, West Africa, such as the ACTIVLIM-Stroke and ABILOCO-Benin scales, which are designed to measure functional recovery and activity limitations (Batcho et al., 2012; Sogbossi et al., 2014).

2.10 The Importance of Stroke Assessment Scales

Stroke assessment scales play a pivotal role in the early identification, classification, and management of stroke, significantly influencing patient outcomes. Accurate and rapid assessment is essential in the acute phase of stroke to differentiate between ischemic and hemorrhagic strokes and to determine the severity of neurological deficits. Standardized tools such as the National Institutes of Health Stroke Scale (NIHSS) and the Modified Rankin Scale (mRS) have been widely adopted in clinical practice to ensure uniformity in evaluation and documentation (De Rubeis et al., 2024)). These tools provide healthcare professionals with objective criteria to evaluate stroke severity, guide decisions regarding the use of thrombolytic therapy, and predict patient prognosis. Without these scales, clinical judgment might be inconsistent, potentially leading to delays or errors in diagnosis and treatment.

Stroke assessment scales facilitate communication among multidisciplinary teams, particularly during transitions of care. For instance, emergency medical services (EMS) personnel can utilize pre-hospital stroke scales like the Cincinnati Prehospital Stroke Scale (CPSS) or the Los Angeles Prehospital Stroke Screen (LAPSS) to identify suspected strokes and alert receiving hospitals for prompt preparation (Martins, et al., 2024). This early notification is crucial in minimizing door-to-needle times, which directly impacts the efficacy of interventions such as intravenous thrombolysis or mechanical thrombectomy. These scales also provide a common language that enhances coordination between different levels of care, including emergency departments, neurology units, and rehabilitation centers, thus ensuring a streamlined and efficient continuum of care for stroke patients.

Stroke assessment tools are also essential for monitoring progress and evaluating the effectiveness of interventions over time. By using reliable scales, clinicians can track changes in neurological status, assess treatment responses, and make informed decisions regarding rehabilitation and discharge planning. For example, repeated use of the NIHSS helps in identifying early signs of neurological deterioration or improvement, which is crucial for adjusting clinical management (Siniscalchi, et al., 2022). In rehabilitation settings, functional assessment tools like the Barthel Index and the Functional Independence Measure (FIM) are used to evaluate a patient's ability to perform activities of daily living, thereby guiding therapy goals and resource allocation. This dynamic monitoring is vital for optimizing recovery and improving long-term outcomes in stroke survivors.

The use of validated stroke scales enhances research and quality improvement initiatives in stroke care. These tools enable standardized data collection, facilitating comparative studies, clinical trials, and audits aimed at evaluating stroke protocols and patient outcomes. Their application supports evidence-based practice by identifying gaps in care and driving innovations in stroke management. National and international stroke registries often mandate the use of specific assessment scales for benchmarking and policy-making purposes (Front. Neurol., 2019). By ensuring consistency in clinical evaluation, stroke scales contribute significantly to the broader goals of improving stroke systems of care, reducing disability, and lowering stroke-related mortality and healthcare costs.

2.11 Knowledge of Stroke Assessment Scales among Neurological Physiotherapists

The knowledge and utilization of stroke assessment scales among physiotherapists are essential for the effective rehabilitation and monitoring of stroke patients. Physiotherapists play a critical role in evaluating motor function, mobility, balance, and overall functional status, all of which are pivotal in post-stroke recovery. Familiarity with standardized tools such as the National Institutes of Health Stroke Scale (NIHSS), Modified Rankin Scale (mRS), and Fugl-Meyer Assessment (FMA) enables physiotherapists to quantify impairments, track progress, and tailor individualized rehabilitation programs (Okonkwo et al., 2023). The ability to accurately interpret these scales helps in setting realistic therapy goals and ensuring the delivery of evidence-based interventions. Without adequate knowledge of these tools,

physiotherapists may rely solely on subjective assessments, which could hinder clinical decision-making and compromise patient outcomes.

Despite their importance, several studies indicate that there are varying levels of awareness and competence in using stroke assessment scales among physiotherapists, particularly in low-resource settings. A study conducted in Nigeria revealed that although many physiotherapists were involved in stroke rehabilitation, a significant number lacked formal training in the use of standardized stroke scales such as the FMA and Barthel Index **(**Odole et al., 2018). This gap in knowledge has been attributed to limited access to continuing professional development, absence of assessment tools in clinical settings, and inadequate integration of such scales into undergraduate curricula. As a result, physiotherapists may find it challenging to objectively assess stroke severity or evaluate the effectiveness of rehabilitation interventions, which could ultimately delay functional recovery in patients.

Enhancing the knowledge of stroke assessment tools among physiotherapists also supports interdisciplinary collaboration and improves the quality of patient care. Stroke management requires coordinated input from a team of healthcare professionals, including neurologists, nurses, occupational therapists, and physiotherapists. When physiotherapists are proficient in using validated assessment tools, they can effectively communicate clinical findings and contribute meaningfully to treatment planning and outcome evaluations. For instance, the use of the mRS to describe a patient's level of disability can help the entire team align on rehabilitation goals and monitor improvements consistently across settings (Okonkwo et al., 2023**).** This shared understanding promotes continuity of care and helps identify patients who may benefit from

additional services such as assistive devices or community-based rehabilitation programs.

The integration of stroke assessment scales into physiotherapy practice encourages evidence-based care and facilitates clinical research. By consistently applying standardized tools, physiotherapists can contribute to data collection that supports clinical audits, quality improvement initiatives, and academic studies aimed at improving stroke rehabilitation outcomes. Recent global rehabilitation guidelines emphasize the need for structured assessments to monitor therapy outcomes and demonstrate value in clinical settings (Claire et al., 2018). Therefore, investing in continuous training programs, workshops, and curriculum updates to enhance physiotherapists' competence in stroke assessment tools is imperative. This will not only empower them to provide high-quality care but also reinforce their role as key stakeholders in stroke recovery and rehabilitation.

The orientation of physiotherapists towards stroke assessment scales plays a pivotal role in determining their consistent application in clinical practice. These scales provide standardized ways of evaluating stroke severity, monitoring patient progress, and setting rehabilitation goals. When physiotherapists understand the clinical utility of these tools, they are more likely to adopt them. As Eek et al. (2023) stated, “Physiotherapists who are well-informed about the importance of outcome measures in interdisciplinary stroke rehabilitation tend to use them more regularly in practice.” This attitude reflects a broader shift toward evidence-based rehabilitation strategies where data-driven approaches are prioritized.

In many low- and middle-income countries, physiotherapists' attitudes toward stroke assessment tools are often influenced by structural and educational barriers. In Nigeria, for example, Olawale et al. (2022) reported that “the lack of access to validated assessment instruments and the absence of institutional policies mandating their use have created an environment where many clinicians undervalue or ignore these tools.” As a result, physiotherapists may view stroke scales as impractical or irrelevant, especially in busy clinical settings where time constraints are a major concern. This attitude is further compounded by the perception that these tools are too technical or cumbersome to integrate into daily practice without proper training and support.

Educational background and training exposure significantly shape physiotherapists' perception. Physiotherapists who are introduced to standardized assessment scales during their undergraduate or postgraduate training tend to demonstrate more positive attitudes towards their use. Eek et al. (2023) found that “those who had received formal training on stroke assessment scales were more likely to recognize their relevance and apply them in clinical decision-making.” This highlights the importance of embedding assessment tools in professional education curricula. Moreover, continuing professional development initiatives, such as workshops and seminars, serve as platforms for physiotherapists to update their knowledge and shift any existing negative perceptions.

Clinical experience also contributes to shaping attitudes, particularly when physiotherapists witness firsthand the benefits of stroke assessment scales in improving patient outcomes. When tools like the Fugl-Meyer Assessment are used consistently, therapists can more accurately monitor changes in motor

function and tailor interventions accordingly. Alraddadi et al., (2025) emphasized that “structured assessment is not only vital for individual patient management but also for evaluating the overall effectiveness of stroke rehabilitation programs.” This awareness can lead to a more positive and proactive attitude among experienced physiotherapists, who may then advocate for their wider use within multidisciplinary teams.

Organizational support is another determinant of physiotherapists’ attitudes. Workplaces that promote a culture of evidence-based practice, provide access to stroke assessment tools, and encourage collaborative care tend to foster more favorable attitudes. Institutions that integrate stroke scales into electronic health records or mandate their use during patient admission and discharge can significantly influence behavior. As Odole et al., (2018) observed, “institutional mandates and interprofessional collaboration increase the likelihood of physiotherapists perceiving stroke scales as essential rather than optional tools.” Therefore, systemic interventions can transform attitudes from passive resistance to active engagement.

Physiotherapists' attitudes toward stroke assessment scales are shaped by a combination of knowledge, training, clinical experience, and systemic factors. To foster a consistently positive attitude, stakeholders must address barriers such as limited resources, inadequate training, and institutional apathy. Professional bodies and educational institutions must play an active role in promoting awareness, offering continuous training, and advocating for the mandatory use of stroke assessment scales. By shifting attitudes through these measures, physiotherapists can be better positioned to deliver high-quality, standardized, and evidence-based stroke care.

2.12 Use of Stroke Assessment Scales among Physiotherapists in the Management of Stroke

Stroke assessment scales are integral to physiotherapy practice as they provide objective, standardized methods for evaluating stroke severity, planning treatment, and tracking patient outcomes. In clinical rehabilitation, the use of these tools ensures that physiotherapists can quantify impairments, functional limitations, and improvements across time. The National Institutes of Health Stroke Scale (NIHSS), Fugl-Meyer Assessment (FMA), Modified Rankin Scale (mRS), and Barthel Index are among the most widely used tools for this purpose. According (Okonkwo et al., (2023), "the implementation of structured assessment tools in stroke management has been shown to improve rehabilitation outcomes by facilitating timely, appropriate interventions." This underscores the value of incorporating these scales into routine physiotherapy assessments.

Physiotherapists use stroke assessment scales not only to determine the initial severity of neurological deficits but also to establish realistic, patient-specific goals. For instance, the Fugl-Meyer Assessment allows therapists to evaluate motor recovery in stroke survivors, enabling them to tailor exercise protocols based on objective findings. Askim et al. (2013) affirm that "physiotherapists who employ these scales regularly report greater precision in clinical decision-making and improved patient tracking." These tools thus serve as essential guides for prioritizing interventions and modifying therapeutic approaches during recovery phases.

The integration of stroke scales into multidisciplinary stroke care teams enhances communication and coordination. When physiotherapists consistently

document patient progress using recognized scales, it facilitates clearer communication with physicians, occupational therapists, and nurses. Odole et al., (2018) observed that "shared use of outcome measures improves interdisciplinary synergy, streamlines patient management, and aligns team objectives." This collaborative approach not only ensures cohesive patient care but also supports data collection for stroke registries and research.

The digitalization of health records and the integration of stroke assessment scales into electronic systems have further promoted their use in developed healthcare settings. However, in low- and middle-income countries, such infrastructure is often lacking. (Akinsiku et al. 2021)

2.13 Barriers and Facilitators to the Utilization of Stroke Assessment Scales by Neurological Physiotherapists

2.13.1 Barriers to Adoption

Recent surveys across diverse settings, including Saudi Arabia, Nepal, and Nigeria, underscore persistent barriers at both individual and institutional levels. A Saudi Arabian study revealed that although nearly all neuro-physiotherapists employed at least one standardized outcome measure (SOM), time constraints and limited resources—such as unavailability of equipment—remained the most significant challenges (Alhwoaimel et al., 2024). Similarly, a mixed-methods study from Nepal highlighted that high patient caseloads, lack of culturally adapted tools, low health literacy, and poor access to follow-up significantly hindered SOM implementation (Massie et al., 2023). In Nigeria, high knowledge of stroke scales (66%) did not translate to usage, with heavy patient loads and insufficient time being the main barriers (Okonkwo et al., 2023).

2.13.2 Facilitators Enhancing Use

Despite these barriers, strategic facilitators are proving effective at increasing SOM use. In Saudi Arabia, physiotherapists' positive attitudes and the perception that standardized measures aid clinical decision-making and patient communication emerged as strong enablers (Alhwoaimel et al., 2024). In Nepal, external mandates—such as institutional or insurance requirements—and multidisciplinary discussions about outcomes helped embed SOMs into routine clinical workflows (Massie et al., 2023). Furthermore, a 2023 Swedish study observed a generational effect: mid-career physiotherapists, possessing both experience and training, displayed higher utilization of SOMs, evidencing how professional development and supportive peer culture enhance implementation (Eek et al., 2023).

2.13.3 Multi-Level Strategies for Improvement

Effective integration of stroke assessment scales requires addressing barriers across individual, institutional, and policy levels. At the individual level, investment in training and easy-to-follow SOM guides will boost clinicians' confidence and capability. At the organizational level, allocating protected time, ensuring access to necessary equipment, and integrating SOMs into electronic health records can normalize their usage (Alhwoaimel et al., 2024; Massie et al., 2023). Finally, at the system level, endorsement through clinical guidelines, insurance mandates, and professional associations can institutionalize SOM use—reinforced through regular audit and feedback mechanisms to sustain long-term practice change (Alhwoaimel et al., 2024; Massie et al., 2023).

2.14 Instruments that can be used to assess the Knowledge ant Utilization of Stroke Assessment Scale.

2.14.1 Questionnaire on Standardized Outcome Measures in Rehabilitation

This is a descriptive survey instrument designed to evaluate the levels of familiarity, knowledge, and utilization of standardized outcome measures (SOMs) among physiotherapists. The questionnaire was developed based on the concept that familiarity with or use of an instrument should correspond with a basic knowledge of its administration methods (Akinpelu and Eluchie, 2006). It consists of three parts: the first gathers demographic information from the respondent, the second assesses their familiarity with and utilization of a list of specific SOMs, and the third evaluates their knowledge of the administration methods for these measures. In the studies by Akinpelu and Eluchie (2006) and Odole et al. (2018), 16 specific SOMs were listed, covering areas such as pain, back pain disability, generic functional disability, health status, arthritis, and stroke. The questionnaire has demonstrated good test-retest reliability with a correlation coefficient (r) of 0.98 (Akinpelu and Eluchie, 2006). A modified version of this questionnaire by Okonkwo et al. (2023) was used to assess physiotherapists' knowledge and utilization of stroke outcome measures. This modified version was given a 100% Content Validity Index.

Scoring for the questionnaire varies slightly between studies. In the 2006 study by Akinpelu and Eluchie, responses for familiarity and utilization were scored on a 5-point Likert scale (from 0 to 4), with a maximum total score of 64 for each section. Knowledge of administration was scored by giving one point for each correct answer, with a maximum score of 16. A later study by Okonkwo

et al. (2023) used a similar Likert scale but processed the total scores as percentages of the highest possible score. These percentages were then graded into levels: for both knowledge and utilization, scores of 0-49% were graded as poor, 50-69% as fair, and 70-100% as good.

The initial use of this questionnaire in Nigeria in 2006 revealed low levels of familiarity and utilization, with over 60% of physiotherapists being unfamiliar with and having never used 14 of the 16 listed SOMs. The mean knowledge score was also low, at 3.1 out of a possible 16 (Akinpelu and Eluchie, 2006). A follow-up survey a decade later showed a noticeable improvement, though overall utilization remained unsatisfactory (Odole et al., (2018). The 2023 study in Anambra State, Nigeria, which used the grading system, found that while there was a mix of poor (37.5%), fair (30%), and good (32.5%) knowledge among physiotherapists, overall utilization was still poor for 55% of the respondents (Okonkwo et al., 2023).

2.14.2 Survey on Standardized Outcome Measures in Physical Therapist Practice

This is an observational survey designed to determine the extent to which physical therapists use standardized outcome measures, their clinical applications, and their perceptions of the benefits and barriers to their use. The survey instrument was developed by the investigators and its content validity was supported by a review of previous literature and feedback from 14 clinician colleagues. The psychometric properties of the instrument were assessed for internal consistency. The collection of items related to the benefits of using standardized outcome measures demonstrated good internal

consistency with a Cronbach's alpha of 0.84. Similarly, the items related to the barriers to their use also showed good internal consistency with a Cronbach's alpha of 0.83 (Jette et al., 2009; Al-Muqiren et al., 2017). The survey was first used with a random sample of members of the American Physical Therapy Association (APTA). No specific method for generating an overall score or grade for individual respondents was described by its developers; rather, responses are analyzed using descriptive statistics (e.g., frequencies, percentages) and inferential statistics like logistic regression to examine associations between therapist characteristics and the use of outcome measures.

The initial survey found that 48% of the participating physical therapists in the US used standardized outcome measures. Of those who used them, over 90% believed they enhanced communication and helped in directing the plan of care. The most frequently reported barriers were the length of time they took for both patients and clinicians and the difficulty for patients to complete them independently (Jette et al., 2009). A later study utilizing the same survey instrument with physical therapists in Saudi Arabia found a higher usage rate, with 62% of participants indicating they used SOMs. The perceived benefits were similar to the US study, with over 70% agreeing that SOMs enhanced communication and helped motivate patients. The barriers were also consistent, with the time-consuming nature of the measures and the difficulty for patients to understand them being the most common issues. The English language of the measures was also a significant barrier for the Saudi Arabian patient population (Al-Muqiren et al., 2017).

2.15 Summary of Empirical Literature Reviewed

S/N	AUTHOR'S NAMES / COUNTRY	TITLE	OBJECTIVE	RESEARCH DESIGN	SAMPLE SIZE	STATISTICAL TOOL	FINDINGS	LIMITATION
1	Alhowoaimel N.A., Alqahtani B.A., Alhowimel, A.S., Alshehri, M.M., Ahelal, A.K., Al-Assaf, L.G., & Alenai, A. M. / Saudi Arabia / 2024	Barriers and facilitators of using stroke assessment outcome measures in stroke rehabilitation in Saudi Arabia: A cross-sectional study of practice among neuro-physiotherapists.	To assess the current use of SOMs by physiotherapists involved in stroke rehabilitation in Saudi Arabia and identify facilitator and barriers influencing the use of SOMs.	A cross-sectional observatory study using an online survey.	138 physiotherapists.	Statistical package for the social sciences (SPSS, Version 26). Data were descriptively analysed and reported using absolute and relative frequencies.	Most participants (98%) used at least one outcome measure in clinical practice. The most pronounce barrier was time constraints and limited resources.	The survey did not capture the frequency of the use of SOMs in clinical practice. The sample size was small as majority of the participants were from a particular region of the country.
2	Odole, A. C., Oyewole, O. O., and Akinpelu, A. O. / 2018 / Nigeria.	A comparative survey of Nigerian physiotherapists'	To evaluate changes in the familiarity with knowledge and use of	Comparative cross-sectional survey using the validated	183 physiotherapist (response rate: 48% from 382 questionnaire	Descriptive statistics (means, standard deviations, frequencies,	Improvement in familiarity with SOMs from 2006 to 2016, though overall	Use of convenience sampling limits generalizability. Low

		familiarity with knowledge and utilization of stroke outcome measures (SOMs): 10 years after initial survey.	SOMs among Nigerian Physiotherapists over a decade (2006 – 2016), and to identify demographic factors associated with these changes.	questionnaire as in previous 2006 study.	s distributed).	percentages) Binary logistic regression analysis. Significance level set at p = 0.05.	utilization remain low. Factors significantly associated with familiarity or utilization include duration of practice, age and sex.	response rate (48%) may introduce response bias. The 16 SOMs assessed were selected based on assumptions of relevance without documented validation of their appropriateness for Nigerian clinical settings.
3	Okafor U. A. C., Birabi B. N., and Okunuga A. / 2010 / Nigeria.	Knowledge and use of stroke assessment scales by physiotherapists in selected Nigerian	To evaluate the level of knowledge, availability and utilization of stroke assessment scales among	Cross sectional survey using self-administered questionnair	200 questionnaires survey were distributed; 180 were completed and returned (response	Descriptive statistics (percentages were used to summarize data.	66.7% of respondents had knowledge of stroke assessment scales.	Convenience sampling may limit generalizability. The study relied on

		Health Institutions.	some physiotherapists in Nigeria.	es.	rate: 90%).		Only 28% were taught stroke scales during training. 30.6% had access to stroke scales in their clinical settings. Despite availability, 70% did not utilize them citing high patient load and time constraints. 100%of participants desired access to stroke scales. 90% agreed that stroke scales help with goal	self- reported data, which could introduce response bias. Limited use of inferential statistics restricts deeper analysis of relationships between variables.

							setting and patient reintegration.	
4	Okonkwo, U.P., Eze, C. C., ibeneme, S.C., Igwu, S.E., Chukwuemeka, U. M., Ihegihu, E. Y., and Ugwuanyi, D. C. / 2023 / Nigeria.	Knowledge and utilization of standardized stroke outcome measures among physiotherapists in tertiary institutions in Anambra state, Nigeria.	To assess the knowledge and utilization of standardized stroke outcome measures (SOMs) among physiotherapists in tertiary hospital in Anambra state, and to determine the influence of socio demographic variable on the knowledge and usage.	Cross – sectional survey research design.	40 physiotherapists (16 females and 24 males.	Descriptive statistics (frequency counts, percentages, mean standard deviation) Chi-square test for association Spearman rank – order correlation IBM SPSS version 21 Alpha level: 0.05.	37.5% of respondents had poor knowledge, 30% had fair knowledge, 32.5% had good knowledge of SOMs. 55% had poor utilization, 25% fair, and 20% good utilization. Familiarity was highest for: 6-minutes walk test (72.5%), Modified Ashworth Scale(70%), Barthel Index	Small sample size may limit generalizability. Study restricted to only two institutions in one Nigerian state Potential self-reporting bias due to questionnaire based design. Limited exploration of the specific barriers and enablers to SOMs use.

							(67.5%), and others Significant positive correlation between knowledge and utilization (r = 0.741, p < 0.01) Educational qualification and gender significantly influenced both knowledge and utilization. Years of experience and institution were significantly associated with	

							utilization only.	
5	Seth K.Wame Agyenkwa, Cosmos Yarfi, Adjoa Nkrumah Banson, Woyram Abla Kofi-Bediako, Ulric Sena Abonie, Seth Kwadjo Angmorterh and Eric Kwasi Ofori. /2020 / Ghana.	Assessing the use of standardized outcome measures for stroke rehabilitation among physiotherapists in Ghana.	To assess the current practice of physiotherapists in Ghana regarding the use of standardized outcome measures in the rehabilitation of stroke patients.	Descriptive cross sectional survey.	105 registered physiotherapists in Ghana	Data were analysed using SPSS version 25.0. frequencies and percentages were used for demographics . Chi-square tests were used to examine associations with a significance level of $p < 0.05$.	52.4% of physiotherapists did not use outcome measures. Usage was higher among physiotherapists under 40 years (64.7%) and those working in public facilities (56.2%). The use of outcome measures was significantly associated with the number of stroke patients seen	Reliance on self reported data. Inadequate response to semi-structured questions limited deeper qualitative insights.

							weekly and the availability of recommended outcome measures at the facility (p = 0.013 and p = 0.0001 respectively).	
6	Van Peppen, R. P., Maissan, F. J., Van Genderen, F. R., Van Dolder, R., and Van Meeteren, N. L. / Netherlands / 2008.	Outcome measures in physiotherapy management of patient with stroke: a survey into self-reported use, and barriers to and facilitators to use.	To investigate physiotherapists' self-reported use of outcome measures as recommended in Dutch clinical practice guidelines on physiotherapy management of patients with stroke and assess the perceived barriers to	Cross sectional study.	167 physiotherapists.	Descriptive statistics (frequency counts, percentages, mean standard deviation).	The physiotherapists reported using three of the seven recommended outcome measures with those working in two of the locations reporting a significant higher use than their colleagues in other	The study relied on self- reported data, which could introduce response bias.

			and facilitators for the use of outcome measures in daily practice.				hospitals. It was also revealed that there were setting specific facilitators such as a positive attitude towards outcome measures and acquaintances with outcome measures and barriers such as time constraint and financial compensation.	

CHAPTER THREE

MATERIALS AND METHODS

3.1 Materials

3.1.1 Population

The target population for this study included male and female neurological physiotherapists involved in care and rehabilitation of stroke patients in selected hospitals and clinics throughout Benin City.

3.1.2 Selection Criteria

3.1.2.1 Inclusion Criteria

Respondents who met the following criteria were included in the study:

i. Licensed neurological physiotherapists practicing in Benin City.

ii. Physiotherapist involved in care and rehabilitation of stroke patients.

3.1.2.2 Exclusion Criteria

The study excluded:

i. |Physiotherapist not involved in treatment of stroke patients.

ii. Individuals unwilling to participate in the online survey.

3.1.3 List of instruments

Questionnaire on Standardized Stroke Assessment Scales in Rehabilitation

3.1.4 Description of instrument

Questionnaire on Standardized Stroke Assessment Scales in Rehabilitation.

This is a descriptive survey instrument designed to evaluate the levels of familiarity and utilization of standardized stroke assessment scales among

physiotherapists (Akinpelu & Eluchie, 2006). It consists of three parts: the first gathers demographic information from the respondent, the second assesses their familiarity with and utilization of a list of specific SASs, and the third evaluates level of utilization of these scales. The questionnaire has demonstrated good test-retest reliability with a correlation coefficient (r) of 0.98 (Akinpelu & Eluchie, 2006). A modified version of this questionnaire by Okonkwo et al. (2023) was used to assess physiotherapists' knowledge and utilization of stroke outcome measures. This modified version was given a 100% Content Validity Index. The content validity test was conducted by consulting three expert; two in physiotherapy and one expert in internal medicine. Two of the experts was requested to evaluate and identify whether the questions agreed with the scope of the items and the extent to which these items reflect the concept of the research problem. Another expert was requested to evaluate that the questions were designed well enough to provide relations and tests between variables. The group of experts did agree that the questionnaire was valid and suitable enough to measure.

The reliability of this questionnaire was determined by the internal consistency and acceptable reliability. The split-half method of reliability was used in obtaining the data that was subjected to spearman and the coefficient or 0.79 was obtained and it was concluded for calculating Cronbach's alpha coefficient questionnaire were completed by 10 participants to measure the internal consistency of the method. Using the intra-class correlation coefficient, the questionnaire was analysed using the SPSS 27 and all questions that had an ICC greater than 0.7 were considered acceptable.

3.2 Methods

3.2.1 Research Design

The study employed a cross sectional design to assess the knowledge and utilization of stroke assessment scales by neurological physiotherapists in selected hospitals.

3.2.2 Sampling Technique

A convenience sampling technique was used to recruit respondents who met the inclusion criteria. Neurological physiotherapists were contacted and given the questionnaire to fill appropriately.

3.2.3 Sample Size

The minimum sample size was calculated using Taro Yamane's formula, considering a confidence level of 95% and a margin error of 5%.

$n = N / (1 + N (e)^2)$ (Taro Yamane's formula)

n = Sample size

N = Population size of neurological physiotherapist in Benin City.

e = Level of precision or sampling of error which is ±5%

N = 48 (NSP, Edo Chapter, 2025)

$n = 48 / (1 + 48 \times 0.05^2)$

$n = 48 / (1 + 0.12)$

$n = 42.86$

The approximated minimum sample size for this study is 43 respondents.

3.2.4 Ethical Consideration

Ethical approval for this study was obtained from the Research Ethics Committee of the College of Medical Sciences, University of Benin. Informed consent was also gotten from respondents in the study ensuring that respondents' privacy and confidentiality were protected.

3.2.5 Procedure for Data Collection

The following steps were followed during data collection

i. Recruitment: The hospitals and clinics of potential respondents were visited with an explanation of the study's aim and an invitation to participate.

ii. Survey administration: The survey was printed and given to the respondents and received back as soon as they had filled them.

iii. Data storage: All data collected was stored securely, and confidentiality was maintained by keeping the data collected anonymous.

3.2.6 Data Analysis

The data obtained was analysed using both descriptive and inferential statistics. Descriptive statistics of frequency and percentage were used to summarize the demographic variables, the knowledge and utilization of stroke assessment scales of the respondents. Also, inferential statistics of chi-square was used to test the hypotheses. Statistical significance was accepted for p-value of 0.05. All analyses were performed with the use of Statistical Package for the Social Sciences (SPSS) version 27.0.

CHAPTER FOUR

RESULTS

This study was undertaken to evaluate the knowledge and utilization of stroke assessment scales among neurological physiotherapist in selected hospitals in Benin City, Edo State. Data was analysed using IBM SPSS statistics for Windows version 27.0. Descriptive statistics were used to summarize demographic data, knowledge scores and utilization patterns. The Chi-square was employed to test associations between variables. A p-value of less than 0.05 was considered statistically significant.

4.1 Results

4.1.1 Descriptive Statistics of Respondents Demographics

A total of 43 respondents participated in this study, 22(51.2%) were females while 21(48.8%) were males. The primary place of practice of majority of the respondents was UBTH accounting for 32(74.4%) and other locations like ESH accounting for 6(14%), FPC – 2(4.7%), and CPC – 3(7%). Likewise, BSc was the highest educational qualification of most of the respondents 39(90.7%); 3(7%) had DPT and 1(2.3) of the respondents had a PhD degree. More so, majority of the respondents - 25 (58.1%) were of PT cadre, 11(25.6) were of SPT cadre and 7(16.3%) being in the CPT cadre. Similarly majority of the respondents had practiced for 5 to 10 years 39(90.7%) while the others – 4(9.3%) of the respondents had experience spanning between 10 to 20 years of practice.

Table 4.1: Descriptive Statistics of the Demographic Parameters of the Respondents.

N = 43

Variables	Category	Frequency	Percentage (%)
Gender	Male	21	48.8
	Female	22	51.2
Primary Place of Practice	UBTH	32	74.4
	ESH	6	14.0
	FPC	2	4.7
	CPC	3	7.0
Highest Educational Qualification	BSc	39	90.7
	DPT	3	7.0
	MSc	0	0
	PhD	1	2.3
Rank	PT	25	58.1
	SPT	11	25.6
	CPT	7	16.3
Years of Practice as a Physiotherapist	5 – 10	39	90.7
	10 – 20	4	9.3
	20 and above	0	0

4.1.2 Descriptive Statistics of Knowledge and Utilization of Stroke Assessment Scales

Majority of the respondents 24 (55.8%) had fair knowledge of stroke assessment scale while 7 (16.3%) has poor knowledge and 12 (27.9%) had good knowledge. Also, most of the respondents 20 (46.5%) had moderate utilization of stroke assessment scale while 11 (25.6%) had low utilization and 12 (27.9%) had high utilization. This is reflected in Table 4.2.

Table 4.2: Descriptive Analysis of Knowledge and Utilization of Stroke Assessment Scale

N = 43

Variables	Frequency	Percentage
Knowledge of Stroke Assessment Scale		
Poor Knowledge	7	16.3
Fair Knowledge	24	55.8
Good Knowledge	12	27.9
Utilization of Stroke Assessment Scale		
Low Utilization	11	25.6
Moderate Utilization	20	46.5
High Utilization	12	27.9

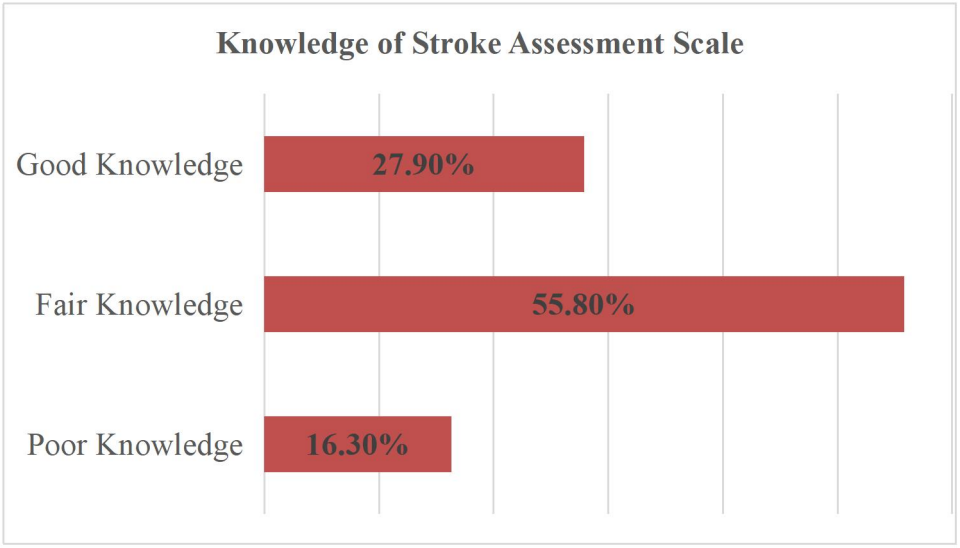

Figure 4.1: Knowledge of Stroke Assessment Scale of Neurological Physiotherapists.

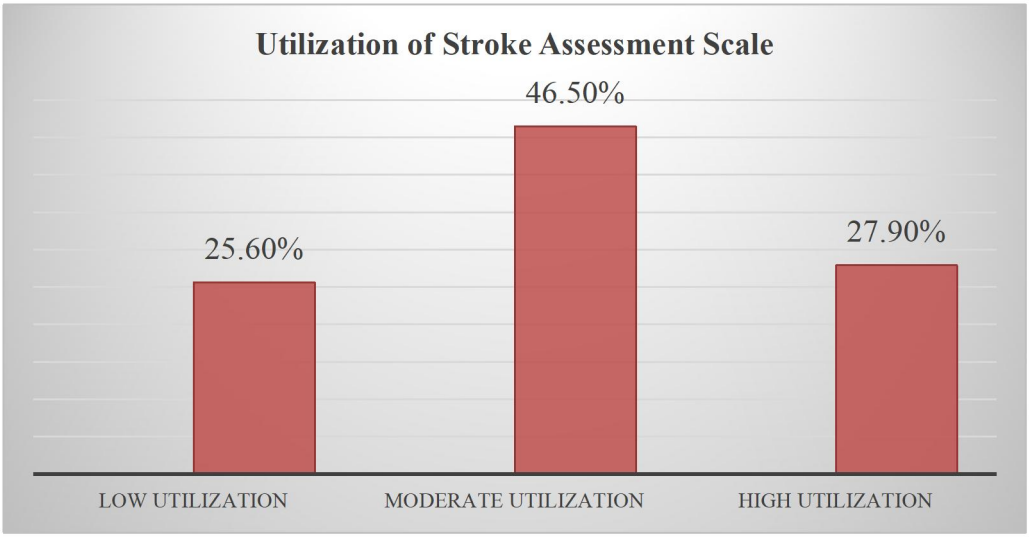

Figure 4.2: Utilization of Stroke Assessment Scale by Neurological Physiotherapists

4.2 Chi-square Test of Association

Table 4.3 presents the results of the Chi-square tests examining the associations between knowledge, utilization, and selected demographic and professional variables among neurological physiotherapists. The analysis revealed a statistically significant association between knowledge and utilization of stroke assessment scales (χ^2 = 13.195a, p = 0.010), indicating that a higher level of knowledge among neurological physiotherapists is significantly associated with greater utilization of these scales.

Furthermore, there was a significant correlation between knowledge of stroke assessment scales and gender (χ^2 = 8.100a, p = 0.017), suggesting that gender may influence the level of knowledge possessed by neurological physiotherapists. However, the association between gender and utilization of stroke assessment scales (χ^2 = 4.870a, p = 0.088) was not statistically significant, indicating that gender does not substantially affect the use of these scales in clinical practice. In addition, the association between knowledge of stroke assessment scales and highest educational qualification (χ^2 = 3.308a, p = 0.508) was not significant, implying that educational attainment does not necessarily determine the level of knowledge regarding stroke assessment scales. Similarly, the association between utilization of stroke assessment scales and highest educational qualification (χ^2 = 6.181a, p = 0.186) was not significant, indicating that qualification level does not have a substantial influence on utilization. Lastly, there was no significant association between knowledge of stroke assessment scales and professional rank (χ^2 = 6.457a, p = 0.167), nor between utilization of stroke assessment scales and professional rank (χ^2 = 6.457a, p = 0.167). This suggests that professional position does not considerably influence either knowledge or utilization of stroke assessment scales among neurological physiotherapists.

Table 4.3: Chi-square Test of Association between Variables

N = 43

	Knowledge of Stroke Assessment Scale	X^2	Df	P	Utilization of Stroke Assessment Scale	X^2	Df	P
Knowledge of Stroke Assessment Scale						13.195[a]	4	0.010
Utilization of Stroke Assessment Scale		13.195[a]	4	0.010				
Gender		8.100[a]	2	.017		4.870[a]	2	.088
Highest Educational Qualification		3.308[a]	4	.508		6.181[a]	4	.186
Rank		6.457[a]	4	.167		6.457[a]	4	.167

4.3 Hypotheses Testing

Hypothesis 1: There is no significant association between knowledge of stroke assessment scale and utilization of stroke assessment scale.

Alpha level: .05

Test statistic: Chi-square test

Observed: P<.05

Decision: Since the observed p-values of the association between knowledge of stroke assessment scale and utilization of stroke assessment scale was <.05, the hypothesis was REJECTED.

Hypothesis 2: There is no significant association between knowledge of stroke assessment scale and gender of the respondents.

Alpha level: .05

Test statistic: Chi-square test

Observed: P<.05

Decision: Since the observed p-values of the association between knowledge of stroke assessment scale and gender of the respondents was < .05, the hypothesis was REJECTED.

Hypothesis 3: There is no significant association between knowledge of stroke assessment scale and highest educational qualification of the respondents.

Alpha level: .05

Test statistic: Chi-square test

Observed: P>.05

Decision: Since the observed p-values of the association between knowledge of stroke assessment scale and highest educational qualification of the respondents was > .05, the hypothesis was NOT REJECTED.

Hypothesis 4: There is no significant association between knowledge of stroke assessment scale and professional cadre (rank) of the respondents.

Alpha level: .05

Test statistic: Chi-square test

Observed: P>.05

Decision: Since the observed p-values of the association between knowledge of stroke assessment scale and professional cadre (rank) of the respondents was > .05, the hypothesis was NOT REJECTED.

Hypothesis 5: There is no significant association between utilization of stroke assessment scale and gender of the respondents.

Alpha level: .05

Test statistic: Chi-square test

Observed: P>.05

Decision: Since the observed p-values of the association between utilization of stroke assessment scale and gender of the respondents was > .05, the hypothesis was NOT REJECTED.

Hypothesis 6: There is no significant association between utilization of stroke assessment scale and highest educational qualification of the respondents.

Alpha level: .05

Test statistic: Chi-square test

Observed: P>.05

Decision: Since the observed p-values of the association between utilization of stroke assessment scale and highest educational qualification of the respondents was > .05, the hypothesis was NOT REJECTED.

Hypothesis 7: There is no significant association between utilization of stroke assessment scale and professional cadre (rank) of the respondents.

Alpha level: .05

Test statistic: Chi-square test

Observed: P>.05

Decision: Since the observed p-values of the association between utilization of stroke assessment scale and professional cadre (rank) of the respondents was > .05, the hypothesis was NOT REJECTED.

CHAPTER FIVE

DISCUSSION, CONCLUSION, RECOMMENDATIONS AND IMPLICATIONS

5.1 Discussion

The result of the present study revealed that physiotherapists practicing in Benin City were predominantly young with years of experience less than 10 years and the higher prevalence of BSc degree which are all consistent to the findings of previous studies like Okonkwo et al., (2023) and Odole et al., (2018) in Nigeria. Notably too, most of the respondents were from UBTH compared to other institutions, this is justified by the fact that it is a tertiary health institution hence with more manpower to meet up with the higher demand for neurological physiotherapy care.

A strong correlation between knowledge and the utilization of stroke assessment scales was shown highlighting the importance of knowledge in influencing the adoption of tools in clinical settings. The findings of this study revealed a statistically significant relationship between the knowledge of stroke assessment scales and the gender of neurological physiotherapists. This outcome aligns with the results reported by Okonkwo et al., (2023) and Okafor et al., (2010), who also observed gender-related differences in the knowledge and awareness of stroke assessment tools among physiotherapists. However, the present study found no significant association between knowledge of stroke assessment scales and the highest educational qualifications of respondents. This contrasts with the findings of Okonkwo et al., (2023), who reported a significant relationship, suggesting that higher academic attainment may contribute to increased knowledge of stroke assessment tools. In addition, no significant association was found between knowledge of stroke assessment scales and the professional cadre of the

physiotherapists. This finding corroborates the report of Okonkwo et al., (2023), indicating that professional rank or years of experience may not necessarily influence a physiotherapist's familiarity with stroke assessment instruments.

Furthermore, this study demonstrated a significant relationship between knowledge and utilization of stroke assessment scales among neurological physiotherapists. This result is consistent with the findings of Okonkwo et al. (2023), Okafor et al., (2010), Odole et al., (2018), and Agyenkwa et al., (2020), who similarly reported that physiotherapists with better knowledge of stroke assessment tools tend to exhibit higher levels of clinical application and utilization.

Conversely, the current study found no significant association between the utilization of stroke assessment scales and demographic or professional variables such as gender, highest educational qualification, and professional cadre. These findings are in agreement with the reports of Seth et al., (2020) and Alhowoaimel et al., 2024 who also observed a lack of relationship between utilization patterns and these factors. However, they are at variance with the results of Okonkwo et al., (2023) and Odole et al., (2018), both of whom reported significant associations between utilization of stroke assessment tools and these professional characteristics.

According to this study's finding, only 27.9% of neurological physiotherapists in Benin City showed good knowledge of stroke assessment scales, while the majority (55.8%) showed fair knowledge. This findings showed an improvement in results as compared to past studies where poor knowledge was dominant like in the study by Odole et al., (2018) and Okonkwo et al in 2023. This suggests that while awareness is present, thorough mastery is still lacking indicating that many neurological physiotherapists only have a cursory comprehension of assessment scales and lack in

depth knowledge required for regular use in clinical settings. Intermediate knowledge level were attributed to be a result of a lack of institutional training and restricted for continuing professional education.

Utilization levels were also unsatisfactory, with only 27.9% of respondents indicating high utilization, 46.5% reporting moderate use and 25.6% reporting low utilization. This data points out the knowledge practice gap whereas many neurological physiotherapist are aware of assessment scales, only a tiny minority use them regularly. This inclination is consistent with previous Nigerian investigations. According to Okonkwo et al (2023), just 20% of physiotherapist used their skills well while majority used them poorly. Similarly Okafor et al., (2010) discovered that more than 70% of physiotherapist did not consistently use stroke assessment scales owing to time restrictions, workload and a lack of training. This points to some regional improvement, which could be brought about by local policies, institutional changes or differences in training exposure. However, the fact that only moderate use has persisted in spite of comparatively improved understanding highlights the fact that awareness by itself does not ensure clinical adoption. With the exception of knowledge itself, which was found to strongly predict utilization and demographic characteristics, in contrast to Okonkwo et al (2023) who found that demographic factors (e.g., years of experience, qualification and gender) significantly influence utilization.

When compared internationally, utilization in Benin City is significantly lower. According to Al-Muqiren et al. (2017) discovered 62% usage in Saudi Arabia. More recently, 98% of Saudi Physiotherapists reported using it according to Alhowoaimel et al. (2024). The difference between environments with low and abundant resources is emphasized by higher global figures. This discrepancy is probably explained by

more institutional support, required continuous professional development (CPD) and the incorporation of standardized outcome measures into clinical recommendations in high income nations. Therefore the results of this study points to a structural issue in Nigeria's healthcare system, where regular use is hampered by a lack of institutional support and lax implementation of evidence based practice.

5.2 Conclusion

The study therefore concluded that only a small percentage of neurological physiotherapists in a good number of Benin City hospitals exhibit high levels of understanding and utilization of stroke assessment scales while most exhibit fair levels of knowledge and moderate level of utilization of stroke assessment scales. Utilization was found to be highly influenced by knowledge although professional and demographic factors had no discernible impact. These findings emphasize how crucial it is to provide institutional support and ongoing education in order to close the knowledge practice gap.

5.3 Recommendation

To enhance the quality and standardization of stroke rehabilitation, a multi-faceted strategy is recommended. Firstly, continuous professional development is essential; this involves instituting frequent workshops, seminars and hands on training sessions aimed at strengthening physiotherapists' conceptual understanding and practical proficiency with standardized stroke assessment scales. To institutionalize this practice, it is imperative for hospital administrations to integrate formal policies that mandate the use of these validated instruments within neurological rehabilitation services. Furthermore, the effective implementation of such policies is contingent upon adequate resource provision. Clinical departments must be equipped with

sufficient access to these standardized assessment tools to promote their consistent and uniform application. From an educational perspective, a foundational shift is also necessary; a comprehensive review of undergraduate and graduate physiotherapy curricula should be undertaken to ensure the integration of thorough instruction on the principles and application of stroke assessment scales.

Finally, to foster a cycle of continuous improvement, initiatives for monitoring and research should be promoted. This includes conducting studies to identify persistent barriers to utilization and developing targeted strategies to advance evidence based stroke care practices, thereby ensuring that clinical protocols remain aligned with the latest empirical findings.

5.4 Clinical implication

The consistent and proficient application of standardized stroke assessment scales by physiotherapists carries significant implications across multiple domains of healthcare. Clinically, enhanced competency in these instruments will directly improve diagnostic accuracy, facilitate more precise treatment planning and enable robust tracking of patient progress, thereby elevating the overall quality of care. On a professional level, the cultivation of these skills serves to increase practitioner confidence, reinforce accountability and promote a much needed standardization of practice among physiotherapists. For healthcare institutions, the routine implementation of these validated measure is anticipated to yield improved patient outcomes, enhance interdisciplinary communication through a common objective language and solidify a reputation for high quality, evidence based neurological rehabilitation. Consequently, these findings underscore a critical policy implication, it is imperative for Nigerian healthcare policymakers to prioritize strategic funding

and mandate ongoing professional development in neurological rehabilitation to systematically embed these advancements into the national healthcare framework.

REFERENCES

Adeloye, D., Anyaehie, U.S. and Auta, A., 2019. Current prevalence pattern of hypertension in Nigeria: A systematic review. PloS One, 14(10), p.e0223620.

Aiwansoba, I.F., Ibiene, O.E., Ashinedu, U.R., Olubunmi, O.A. and Mohammadu, N.M., 2014. Benin stroke score in the diagnosis of acute brain infarct: a pilot study in Senegalese Africans. Annals of African Medicine, 13(4), pp.157–160.

Akinsiku, A., Avellino, I., Graham, Y. and Mentis, H.M., 2021. It's not just the movement: Experiential information needed for stroke telerehabilitation. arXiv preprint. Available at: https://arxiv.org/abs/2101.00000 [Accessed 21 Jun. 2025]. (Note: Replace the link with the actual arXiv link if available.)

Akinyemi, R.O., Owolabi, M.O., Ihara, M., Damasceno, A., Ogunniyi, A. and Dotchin, C., 2021. Stroke in Africa: Profiles, progress, prospects and priorities. Nature Reviews Neurology, 17(10), pp.634–656.

Al-Dhahir, M.A., Das, J.M. and Sharma, S., 2023. Neurogenic pulmonary edema. In: StatPearls. Treasure Island (FL): StatPearls Publishing. Available at: http://www.ncbi.nlm.nih.gov/books/NBK532984/ [Accessed 20 Jan. 2024].

Albishi, A.M., Althubaiti, M., Alharbi, N. and Almutairi, F., 2025. Translation, cross-cultural adaptation, and psychometric properties of the Arabic version of the Assessment Life Habits (LIFE-H 3.1) scale for patients with stroke. Disability and Rehabilitation, pp.1–10. (Add volume/issue if available.)

Alexandra, G., Asha, R., Mariana, R. and Yarelly, V., 2019. Mini-Mental State Examination. (Add journal or source if available; this citation is currently incomplete.)

Alhwoaimel, R.S., et al., 2024. Barriers and facilitators of using standardized outcome measures in stroke rehabilitation in Saudi Arabia: A cross-sectional study of practice among neurophysiotherapists. Rehabilitation Medicine and Health Policy, 2024. (Add volume/issue/pages if available.)

Alraddadi, N., Alotaibi, K., Alharbi, M., et al., 2025. Evaluating an online stroke training programme for Saudi Arabian physiotherapists for improving their

knowledge and confidence in long-term stroke care: A pilot mixed-methods study. BMC Medical Education, 25(1), p.68.

Alt Murphy, M., 2024. Fugl-Meyer Assessment. Gothenburg: Institute of Neuroscience and Physiology, University of Gothenburg.

Appelros, P., Stegmayr, B. and Terént, A., 2009. Sex differences in stroke epidemiology: A systematic review. Stroke, 40(4), pp.1082–1090.

Askim, T., Indredavik, B., Engen, A., Roos, K., Aas, T. and Mørkved, S., 2013. Physiotherapy after stroke: To what extent is task-oriented practice a part of conventional treatment after hospital discharge? Physiotherapy Theory and Practice, 29(5), pp.343–350.

ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories, 2002. ATS statement: guidelines for the six-minute walk test. American Journal of Respiratory and Critical Care Medicine, 166(1), pp.111–117.

Balami, J.S. and Buchan, A.M., 2012. Complications of intracerebral haemorrhage. The Lancet Neurology, 11(1), pp.101–118. Available at: https://doi.org/10.1016/S1474-4422(11)70264-2.

Banks, J.L. and Marotta, C.A., 2007. Outcomes validity and reliability of the modified Rankin scale: implications for stroke clinical trials: a literature review and synthesis. Stroke, 38(3), pp.1091–1096.

Barbhaiya, M., Feldman, C.H., Guan, H., Chen, S.K., Fischer, M.A., Solomon, D.H., Everett, B.M. and Costenbader, K.H., 2019. Racial/ethnic variation in stroke rates and risks among patients with systemic lupus erythematosus. Seminars in Arthritis and Rheumatism, 48(5), pp.840–846. Available at: https://doi.org/10.1016/j.semarthrit.2018.07.012.

Batcho, C.S., Tennant, A. and Thonnard, J.L., 2012. ACTIVLIM-Stroke: A cross-cultural Rasch-built scale of activity limitations in patients with stroke. Stroke, 43(3), pp.815–823.

Berg, K., Wood-Dauphinee, S. and Williams, J.I., 1995. The Balance Scale: Reliability assessment with elderly residents and patients with an acute stroke. Scandinavian Journal of Rehabilitation Medicine, 27(1), pp.27–36.

Berg, T., 2009. Berg Balance Scale. Archives of Physical Medicine and Rehabilitation, 73, pp.2–5. (Note: Confirm the journal title and volume number—this entry may contain inconsistencies.)

Berube, S., Nonnemacher, J., Demsky, C., Glenn, S., Saxena, S., Wright, A. and others, 2019. Stealing cookies in the twenty-first century: Measures of spoken narrative in healthy versus speakers with aphasia. American Journal of Speech-Language Pathology, 28(1 Suppl), pp.321–329. Available at: https://doi.org/10.1044/2018_AJSLP-17-0131.

Boehme, A.K., Esenwa, C. and Elkind, M.S.V., 2017. Stroke risk factors, genetics, and prevention. Circulation Research, 120(3), pp.472–495. Available at: https://doi.org/10.1161/CIRCRESAHA.116.308398.

Bottemiller, K.L., Bieber, P.L., Basford, J.R. and Harris, M., 2006. FIM scores, FIM efficiency, and discharge disposition following inpatient stroke rehabilitation. Rehabilitation Nursing Journal, 31(1), pp.22–25.

Bour, A., Rasquin, S., Boreas, A., Limburg, M. and Verhey, F., 2010. How predictive is the MMSE for cognitive performance after stroke? Journal of Neurology, 257(4), pp.630–637.

Broderick, J., Adeoye, O. and Elm, J., 2017. Evolution of the modified Rankin Scale and its use in future stroke trials. Stroke. (Note: Add volume/issue/page number if available.)

Broughton, B.R., Reutens, D.C. and Sobey, C.G., 2009. Apoptotic mechanisms after cerebral ischemia. Stroke, 40(5), pp.e331–e339.

Buchanan, J.L., Andres, P.L., Haley, S.M., Paddock, S.M. and Zaslavsky, A.M., 2003. An assessment tool translation study. Health Care Financing Review, 24(3), pp.45–60.

Budinčević, H., Meštrović, A. and Demarin, V., 2022. Stroke scales as assessment tools in emergency settings: A narrative review. Medicina (Kaunas, Lithuania), 58(11), p.1541. Available at: https://doi.org/10.3390/medicina58111541.

Caneda, M.A.G., 2014. Stroke Assessment Scales: The Dilemma – Validity or Reliability. Neurology Department of GHC, Hospital Nossa Senhora da Conceição,

Porto Alegre, Brazil. [online] Available at: http://creativecommons.org/licenses/by/4.0/ [Accessed 21 Jun. 2025].

Caplan, L.R., Kasner, S.E. and Dashe, J.F., 2022. Stroke: Etiology, classification, and epidemiology. In: Post, T.W. (ed.) UpToDate. Waltham, Massachusetts: UpToDate.

Cecchi, F., Carrabba, C., Bertolucci, F., Castagnoli, C., Falsini, C., Gnetti, B., and Alt Murphy, M., 2020. Transcultural translation and validation of Fugl–Meyer assessment to Italian. Disability and Rehabilitation, 43(25), pp.3717–3722. Available at: https://doi.org/10.1080/09638288.2020.1746844.

Chen, S., Zeng, L. and Hu, Z., 2014. Progressing hemorrhagic stroke: categories, causes, mechanisms and managements. Journal of Neurology, 261(11), pp.2061–2078. Available at: https://doi.org/10.1007/s00415-014-7291-1.

Chukwuonye, I.I., Ohagwu, K.A., Uche, E.O., Chuku, A., Nwanke, R.I., Ohagwu, C.C., Ezeani, I.U., Nwabuko, C.O., Nnoli, M.A., Oviasu, E. and Ogah, O.S., 2015. Validation of Siriraj stroke score in southeast Nigeria. International Journal of General Medicine, pp.349–353.

Claire, M., Ayaka, T., Janice, P., Pat, D., Nicholas, D., Embleton, A.P.B., 2018. Current therapeutic management of perinatal stroke with a focus on the upper limb: A cross-sectional survey of UK physiotherapists and occupational therapists. Disability and Rehabilitation, 44(11), pp.1927–1933. Available at: https://doi.org/10.1080/09638288.2020.1804611.

Cleland, B.T., Perez-Ortiz, A. and Madhavan, S., 2020. Walking test procedures influence speed measurements in individuals with chronic stroke. Clinical Biomechanics (Bristol, Avon), 80, p.105197.

Cummock, J.S., Wong, K.K., Volpi, J.J. and Wong, S.T., 2023. Reliability of the National Institutes of Health (NIH) Stroke Scale between emergency room and neurology physicians for initial stroke severity scoring. Cureus, 15(4), p.e37595. Available at: https://doi.org/10.7759/cureus.37595.

De Rubeis, L., , 2024. Heterogeneity in measurement of NIHSS: a systematic review. Neurological Sciences. (Add volume/issue/page if available.)

Desrosiers, J., Noreau, L., Robichaud, L., Fougeyrollas, P., Rochette, A. and Viscogliosi, C., 2004. Validity of the assessment of life habits in older adults. Journal of Rehabilitation Medicine, 36(4), pp.177–182.

Dias, I.S., Ivo, O.P., Lima, A.C. de S., Brito, A.C.S., Ribeiro, T. dos A., Silva, K.R. and Souza, L.S., 2022. Acidente vascular encefálico e a contaminação pelo Covid-19. Research, Society and Development, 11(8), pp.e57711831330–e57711831330. Available at: https://doi.org/10.33448/rsd-v11i8.31330.

Duncan, P.W., Wallace, D., Lai, S.M., Johnson, D., Embretson, S. and Laster, L.J., 1999. The stroke impact scale version 2.0: evaluation of reliability, validity, and sensitivity to change. Stroke, 30(10), pp.2131–2140.

Eek, F., Åsenlöf, P. and Stigmar, K., 2023. Scientific approach and attitudes among clinically working physiotherapists in Sweden – a cross-sectional survey. Archives of Physiotherapy, 13, p.20.

El Ammar, F., Ardelt, A., Del Brutto, V. and Goldenberg, F., 2020. BE-FAST: A sensitive screening tool to identify in-hospital acute ischemic stroke. Journal of Stroke and Cerebrovascular Diseases, 29(7), p.104821. Available at: https://doi.org/10.1016/j.jstrokecerebrovasdis.2020.104821.

Emergency Medicine Journal, 2016. [no title provided]. Emergency Medicine Journal, 33, pp.818–822.

Emos, M.C. and Rosner, J., 2023. Neuroanatomy, Upper Motor Nerve Signs. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. Available at: https://www.ncbi.nlm.nih.gov/books/NBK539748/ [Accessed 21 June 2025].

Fassbender, K., Balucani, C., Walter, S., Levine, S.R., Haass, A. and Grotta, J.C., 2020. Prehospital stroke management in the thrombectomy era. The Lancet Neurology, 19(7), pp.601–610.

Figueiredo, S., 2008. Assessment of Life Habits (LIFE-H) – Canadian Partnership for Stroke Recovery. [online] Available at: [insert URL] [Accessed 16 June 2025].

Fougeyrollas, P. and Noreau, L., 1998. Assessment of life habits, general short form (Life-H 3.0). Lac St-Charles, Quebec: International Network on the Disability Creation Process.

Frontiers in Neurology, 2019. Evidence-based guidelines and clinical pathways in stroke rehabilitation—An international perspective. Frontiers in Neurology, 10, Article 200. Available at: https://www.frontiersin.org/journals/neurology/articles/10.3389/fneur.2019.00200/full.

Gal, O., Baude, M., Deltombe, T., Esquenazi, A., Gracies, J.M., Hoskovcova, M., Rodriguez-Blazquez, C., Rosales, R., Satkunam, L., Wissel, J., Mestre, T., Sánchez-Ferro, Á., Skorvanek, M., Tosin, M.H.S., Jech, R. and the MDS COA Scientific Evaluation Committee and MDS Spasticity Study Group, 2025. Clinical outcome assessments for spasticity: review, critique, and recommendations. Movement Disorders, 40(1), pp.22–43.

Geerars, M., Wondergem, R. and Pisters, M. F., 2021. Decision making on referral to primary care physiotherapy after inpatient stroke rehabilitation. Journal of Stroke and Cerebrovascular Diseases, 30(5), p.105667.

Ghozy, S., Zayan, A.H., El-Qushayri, A.E., Parker, K.E., Varney, J., Kallmes, K.M., Morsy, S., Abbas, A.S., Diestro, J.D.B., Dmytriw, A.A., Shah, J., Hassan, A.E. and Islam, S.M.S., 2022. Physical activity level and stroke risk in US population: A matched case-control study of 102,578 individuals. Annals of Clinical and Translational Neurology, 9(3), pp.264–275.

Guo, Y., Liu, Z., Zhao, F., Yao, X., Fang, J., Zhang, Y., Wang, H. and Guo, L., 2021. Stroke complications are more troublesome than the stroke event itself: A cross-sectional study of Chinese stroke survivors. Journal of Geriatric Cardiology, 18(3), pp.179–188.

Hamidzadeh, M. and Zeltzer, L., 2011. Six-Minute Walk Test (6MWT) – Canadian Partnership for Stroke Recovery. [online] Available at: https://strokengine.ca/en/assessments/six-minute-walk-test-6mwt/ [Accessed 16 June 2025].

Harb, A., Margetis, K. and Kishner, S., 2025. Modified Ashworth Scale. [Updated 2025 Apr 4]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. Available at: https://www.ncbi.nlm.nih.gov/books/NBK554572/ [Accessed 21 June 2025].

Harrison, J. K., McArthur, K. S. and Quinn, T. J., 2013. Assessment scales in stroke: clinimetric and clinical considerations. Clinical Interventions in Aging, 8, pp.201–211. Available at: https://doi.org/10.2147/CIA.S32405.

Hebert, D., Lindsay, M. P., McIntyre, A., Kirton, A., Rumney, P. G., Bagg, S., Bayley, M., Dowlatshahi, D., Dukelow, S., Garnhum, M. and Glasser, E., 2016. Canadian stroke best practice recommendations: stroke rehabilitation practice guidelines, update 2015. International Journal of Stroke, 11(4), pp.459–484.

Hosoi, Y., Kamimoto, T., Sakai, K., Yamada, M. and Kawakami, M., 2023. Estimation of minimal detectable change in the 10-meter walking test for patients with stroke: a study stratified by gait speed. Frontiers in Neurology, 14, Article 1219505.

Hsueh, I. P., Lin, J. H., Jeng, J. S. and Hsieh, C. L., 2002. Comparison of the psychometric characteristics of the functional independence measure, 5-item Barthel index, and 10-item Barthel index in patients with stroke. Journal of Neurology, Neurosurgery and Psychiatry, 73(2), pp.188–190.

Hugos, C. L. and Cameron, M. H., 2019. Assessment and measurement of spasticity in MS: state of the evidence. Current Neurology and Neuroscience Reports, 19(10), p.79.

Huynh, B. P., Dicarlo, J. A. and Kimberly, T. J., 2023. Sensitivity to change and responsiveness of the Upper Extremity Fugl-Meyer Assessment in individuals with moderate to severe acute stroke. Neurorehabilitation and Neural Repair, 37(8), pp.545–553. Available at: https://doi.org/10.1177/15459683231186985.

Ifeanyi, O., Anukam, K. C., Otikpo, E., Onyedikachi, O. A., Egbuche, O. A. and Onyeneke, O. A., 2020. Prevalence of cardiovascular risk factors among students in a private university in Nigeria: A cross-sectional study. Journal of Applied Sciences, 20(2), pp.64–72.

International Network on the Disability Creation Process (INDCP), 2017. What is LIFE-H? – RIPPH. [online] Available at: [Accessed 16 June 2025].

Joa, K. L., 2024. Outcome measurement in balance problems: Berg Balance Scale. Annals of Rehabilitation Medicine, 48(2), pp.103–104.

Katz, B., Khoury, J., Alwell, K., Moomaw, C. and Kleindorfer, D., 2015. Interrater reliability of the National Institutes of Health Stroke Scale: rating by emergency room physicians and neurologists in a population-based study (P5.140). Neurology, 84(14 Suppl). Available at: https://doi.org/10.1212/WNL.84.14_supplement.P5.140.

Klenow, T. and Klenow, T., 2023. Timed Ten-Meter Walk Test (10MWT): Reference Guide. The American Academy of Orthotists and Prosthetists Outcomes Research Committee.

Komolafe, M. A., Olorunsola, E. O., Fehintola, F. O., Olamoyegun, M. A. and Akinyemi, O., 2015. Obesity and hypertension among church attendees in Ile-Ife, Nigeria. Nigerian Medical Journal, 56(5), pp.322–326.

Kuriakose, D. and Xiao, Z., 2020. Pathophysiology and treatment of stroke: present status and future perspectives. International Journal of Molecular Sciences, 21(20), p.7609. Available at: https://doi.org/10.3390/ijms21207609.

Lasky, S. and Jack, B., 2023. Functional Independence Measure (FIM). [online] Available at: [insert URL] [Accessed 16 June 2025].

Li, K. K. and Diong, J., 2014. National Institute of Health Stroke Scale. Journal of Physiotherapy, 60, p.61.

Liang, M., Yin, M., Guo, B., Pan, Y., Zhong, T., Wu, J. and Ye, Z., 2024. Validation of the Barthel Index in Chinese nursing home residents: An item response theory analysis. Frontiers in Psychology, 15. Available at: https://doi.org/10.3389/fpsyg.2024.1352878.

MacIsaac, R., Ali, M., Peters, M., English, C., Rodgers, H., Jenkinson, C., Lees, K. R., Quinn, T. J. and VISTA Collaboration, 2016. Derivation and validation of a modified short form of the stroke impact scale. Journal of the American Heart Association, 5(5), p.e003108.

Makharia, A., Agarwal, A., Garg, D., Vishnu, V. Y. and Srivastava, M. V. P., 2024. The pitfalls of NIHSS: Time for a new clinical acute stroke severity scoring system in the emergency? Annals of Indian Academy of Neurology, 27(1), pp.15–18. Available at: https://doi.org/10.4103/aian.aian_842_23.

Martins, N., Ejiroghene, E., Fawole, H. O. and Nombeko, M., 2024. Characterization and critical appraisal of physiotherapy intervention research in Nigeria: A systematic review. Physiotherapy Research International, 27(3). Available at: https://link.springer.com/article/10.1186/s12891-023-06986-7.

Massie, N. B. et al., 2023. Barriers and facilitators to implementation of outcome measures among physiotherapists in Nepal: A mixed-methods study. Musculoskeletal Science and Practice, 60, p.102909.

Mendelson, S. J. and Prabhakaran, S., 2021. Diagnosis and management of transient ischemic attack and acute ischemic stroke: A review. JAMA, 325(11), pp.1088–1098. Available at: https://doi.org/10.1001/jama.2020.26867.

Meseguer-Henarejos, A. B., Sánchez-Meca, J., López-Pina, J. A. and Carles-Hernández, R., 2018. Inter- and intra-rater reliability of the Modified Ashworth Scale: A systematic review and meta-analysis. European Journal of Physical and Rehabilitation Medicine, 54(4), pp.576–590.

Michaelsen, S. M. and Rodrigues, L. C., 2024. Stroke Impact Scale. In: Encyclopedia of Quality of Life and Well-Being Research. Cham: Springer, pp.6871–6874.

Miranda, N. and Tiu, T. K., 2023. Berg Balance Testing. In: StatPearls [online]. Treasure Island (FL): StatPearls Publishing.

Miyata, K., Tamura, S., Kobayashi, S., Takeda, R. and Iwamoto, H., 2022. Berg Balance Scale is a valid measure for plan interventions and for assessing changes in postural balance in patients with stroke. Journal of Rehabilitation Medicine, 54, Article jrm00359.

Molloy, D. W. and Standish, T. I., 1997. A guide to the standardized Mini-Mental State Examination. International Psychogeriatrics, 9(S1), pp.87–94.

Moon, H. S. and Keum, J., 2020. Management of stroke in the acute phase: Focus on the golden hour. Journal of the Korean Medical Association, 63(9), pp.566–577.

Moore, J. L., Potter, K., Blankshain, K., Kaplan, S. L., O'Dwyer, L. C. and Sullivan, J. E., 2018. A core set of outcome measures for adults with neurologic conditions undergoing rehabilitation: A clinical practice guideline. Journal of Neurologic Physical Therapy, 42(3), pp.174–220.

Moreno, V. M., Sanz, M. I. M., Fernández, A. M., Maroto, S. G., Fuentes, E. S., Rico, E. P., González, I. S., Gallardo, M. F., Hernando, J. H., Calderón, M. P. B., Jiménez, L. C., Rodríguez, E. S., Vázquez, M. R., Samperiz, H. A., Saiz, I. L. and Guerra, J. M., 2025. Proposal for a revised Barthel Index classification based on mortality risk assessment in functional dependence for basic activities of daily living. Frontiers in Public Health, 12, Article 1478897. Available at: https://doi.org/10.3389/fpubh.2024.1478897.

Mountain, A., Lindsay, M. P., Teasell, R., Salbach, N. M., de Jong, A., Foley, N., Bhogal, S., Bains, N., Bowes, R., Cheung, D. and Corriveau, H., 2020. Canadian stroke best practice recommendations: Rehabilitation, recovery, and community participation following stroke. Part two: Transitions and community participation following stroke. International Journal of Stroke, 15(7), pp.789–806.

Mozaffarian, D., Benjamin, E. J., Go, A. S., Arnett, D. K., Blaha, M. J., Cushman, M. and Turner, M. B., 2016. Heart disease and stroke statistics—2016 update: A report from the American Heart Association. Circulation, 133(4), pp.e38–e360.

Mulder, M. and Nijland, R., 2016. Stroke impact scale. Journal of Physiotherapy, 62(2), p.117.

Nichols-Larsen, D. S., Clark, P. C., Zeringue, A., Greenspan, A. and Blanton, S., 2005. Factors influencing stroke survivors' quality of life during subacute recovery. Stroke, 36(7), pp.1480–1482.

Odetunde, M., 2010. Validation of Yoruba adaptation of the Stroke-Specific Quality of Life Scale.

Odole, A. C., Ogunlana, M. O., Adegoke, B. O. A. and Useh, U., 2012. Knowledge and use of stroke assessment scales by physiotherapists in selected Nigerian health institutions. Nigerian Journal of Medical Rehabilitation, 15(1–2), pp.28–32.

Ojaghihaghighi, S., Vahdati, S. S., Mikaeilpour, A. and Ramouz, A., 2017. Comparison of neurological clinical manifestation in patients with hemorrhagic and ischemic stroke. World Journal of Emergency Medicine, 8(1), pp.34–38.

Okonkwo, U. P., 2023. Knowledge and utilization of standardized stroke outcome measures among physiotherapists in Anambra State, Nigeria. Bulletin of Faculty of Physical Therapy.

Okonkwo, U. P., Eze, C. C., Ibeneme, S. C. et al., 2023. Knowledge and utilization of standardized stroke outcome measures among physiotherapists in tertiary health institutions in Anambra State, Nigeria. Bulletin of the Faculty of Physical Therapy, 28, p.21.

Olawale, O., Olaogun, M. O. and Oke, A. I., 2013. Outcome measures in physiotherapy management of patients with stroke: A survey into self-reported use, and barriers to and facilitators for use.

Olivato, S., Nizzoli, S., Cavazzuti, M., Casoni, F., Nichelli, P. F. and Zini, A., 2016. e-NIHSS: An expanded National Institutes of Health Stroke Scale weighted for anterior and posterior circulation strokes. Journal of Stroke and Cerebrovascular Diseases, 25, pp.2953–2957. https://doi.org/10.1016/j.jstrokecerebrovasdis.2016.08.011.

O'Reilly, N., Jackson, K., Acharya, V., Ajeyalemi, S., Valley Farrell, A., Gadgil, R., Patro, A. and WikiSysop, n.d. Stroke: Physiotherapy assessment. Physiopedia.

Pandian, J. D. and Gall, S. L., 2023. Research and rehabilitation in stroke: it is time to walk the talk. BMJ Global Health, 8(8), p.e011399.

Perna, R. and Temple, J., 2015. Rehabilitation outcomes: Ischemic versus hemorrhagic strokes. Behavioral Neurology, 2015, p.e891651.

Physiopedia, 2024. Modified Rankin Scale. [online] Available at: [insert URL] [Accessed 16 June 2025].

Physiopedia, 2025a. 10 Metre Walk Test. [online] Available at: [insert URL] [Accessed 16 June 2025].

Physiopedia, 2025b. Berg Balance Scale. [online] Available at: https://www.physio-pedia.com/index.php?title=Berg_Balance_Scale&oldid=368235 [Accessed 16 June 2025].

Physiopedia, 2025c. Six Minute Walk Test / 6 Minute Walk Test. [online] Available at: https://www.physio-

pedia.com/index.php?title=Six_Minute_Walk_Test_/_6_Minute_Walk_Test&oldid=364601 [Accessed 16 June 2025].

Quinn, T. J., Dawson, J., Walters, M. R. and Lees, K. R., 2009. Reliability of the modified Rankin Scale: A systematic review. Stroke, 40(10), pp.3393–3395.

Rahman Khan, F., Vijesh, P. V., Rahool, S., Radha, A. A., Sukumaran, S. and Kurupath, R., 2012. Physiotherapy practice in stroke rehabilitation: A cross-sectional survey of physiotherapists in the state of Kerala, India. Topics in Stroke Rehabilitation, 19(5), pp.405–410. https://doi.org/10.1310/tsr1905-405.

Royal College of Physicians, 2016. National clinical guideline for stroke: Prepared by the Intercollegiate Stroke Working Party. The Journal of the Royal College of Physicians of Edinburgh.

Rudd, M., Buck, D., Ford, G. A. et al., n.d. A systematic review of stroke recognition instruments in hospital and pre-hospital settings.

Runde, D., 2020. Calculated decisions: NIH stroke scale/score (NIHSS). Emergency Medicine Practice, 22(7), pp.CD6–CD7.

Sacco, R. L., Kasner, S. E., Broderick, J. P., Caplan, L. R., Connors, J. J., Culebras, A., Elkind, M. S., George, M. G., Hamdan, A. D., Higashida, R. T. and Hoh, B. L., 2013. An updated definition of stroke for the 21st century: a statement for healthcare professionals from the American Heart Association/American Stroke Association. Stroke, 44(7), pp.2064–2089.

Salter, K., Jutai, J., Teasell, R., Foley, N. and Bitensky, J., 2005. Issues for selection of outcome measures in stroke rehabilitation: ICF body functions. Disability and Rehabilitation, 27(4), pp.191–207. https://doi.org/10.1080/09638280400008537.

Scire Professional, 2020. Functional Independence Measure (FIM). [online] Available at: https://scireproject.com/outcome-measures/outcome-measure-tool/functional-independence-measure-fim [Accessed 16 June 2025].

Shewangizaw, S., Fekadu, W., Sackley, C. and Alem, A., 2023. Life after stroke: Exploring social and psychological consequences of stroke survivors and their caregivers. Ethiopian Medical Journal, 61(4).

Siniscalchi, A., 2022. Use of stroke scales in clinical practice: current concepts. Turkish Journal of Emergency Medicine, 22(3), pp.119–124. https://doi.org/10.4103/2452-2473.348440.

Sogbossi, E. S., Thonnard, J. L. and Batcho, C. S., 2014. Assessing locomotion ability in West African stroke patients: validation of ABILOCO-Benin scale. Archives of Physical Medicine and Rehabilitation, 95(8), pp.1470–1476.

Unnithan, A. K. A., Das, M. and Mehta, P., 2023. Hemorrhagic stroke. In: StatPearls. Treasure Island (FL): StatPearls Publishing. Available at: http://www.ncbi.nlm.nih.gov/books/NBK559173/ [Accessed 20 January 2024].

Uzoamaka, A., Oluchukwu, O. and Sochima, O., 2024. Physiotherapists' attitudes, practice and barriers to sexual issues among stroke survivors in South-East Nigeria: a UK survey. Physiotherapy Practice and Research, 42(2), pp.101–110.

Vargas-Sanchez, A., Plaza-Mejia, M. A. and Porras-Bueno, N., 2016. Attitude. In: J. Jafari and H. Xiao, eds. Encyclopedia of Tourism. Cham: Springer.

Veerbeek, J. M., van Wegen, E., van Peppen, R., van der Wees, P. J., Hendriks, E., Rietberg, M. and Kwakkel, G., 2014. What is the evidence for physical therapy poststroke? A systematic review and meta-analysis. PLOS ONE, 9(2), p.e87987. https://doi.org/10.1371/journal.pone.0087987.

Vertesi, A., Lever, J. A., Molloy, D. W., Sanderson, B., Tuttle, I., Pokoradi, L. and Principi, E., 2001. Standardized Mini-Mental State Examination. Use and interpretation. Canadian Family Physician, 47(10), pp.2018–2023.

Wafa, H. A., Wolfe, C. D. A., Emmett, E., Roth, G. A., Johnson, C. O. and Wang, Y., 2020. Burden of stroke in Europe: Thirty-year projections of incidence, prevalence, deaths, and disability-adjusted life years. Stroke, 51(8), pp.2418–2427.

Wang, Z., Gu, A. and Lu, X., 2024. Visual quantitative evaluation of Berg Balance Scale for stroke patients. In: Electronic Engineering and Informatics. Amsterdam: IOS Press, pp.450–457.

Wiesner, K., Schwarz, A., Meya, L., Kaufmann, J. E., Traenka, C., Luft, A. R., Held, J. P. O. and Engelter, S., 2024. Interrater reliability of the Fugl-Meyer Motor

assessment in stroke patients: a quality management project within the ESTREL study. Frontiers in Neurology, 15. https://doi.org/10.3389/fneur.2024.1335375.

World Confederation for Physical Therapy, 2019. Policy statement: Regulation of the physical therapy profession. London: WCPT.

World Health Organization, 2019. Stroke, cerebrovascular accident. Health Topics, p.6.

Yamane, Taro. 1967. Statistics, An Introductory Analysis, 2nd Ed., New York: Harper and Row.

Yannick, B., 2022. Forty years of descriptive epidemiology of stroke. Neuroepidemiology, 56(3), pp.157–162. https://doi.org/10.1159/000525220

Yousufuddin, M., 2017. Impact of multiple chronic conditions in patients hospitalized with stroke and transient ischemic attack. Journal of Stroke and Cerebrovascular Diseases, 26(6), pp.1239–1248. https://doi.org/10.1016/j.jstrokecerebrovasdis.2017.01.015

Zeltzer, L. and McDermott, A., 2010. Berg Balance Scale (BBS) – Canadian Partnership for Stroke Recovery. [online] Available at: https://strokengine.ca/en/assessments/modified-rankin-scale-mrs/ [Accessed 16 June 2025].

Zeltzer, L., 2008. Modified Rankin Scale (MRS) – Canadian Partnership for Stroke Recovery. [online] Available at: https://strokengine.ca/en/assessments/modified-rankin-scale-mrs/ [Accessed 16 June 2025].

Zeltzer, L., 2010. Mini-Mental State Examination (MMSE) – Canadian Partnership for Stroke Recovery. [online] Available at: https://strokengine.ca/en/assessments/mini-mental-state-examination-mmse/ [Accessed 16 June 2025].

Zeltzer, L., 2011. Functional Independence Measure (FIM) – Canadian Partnership for Stroke Recovery. [online] Available at: https://strokengine.ca/en/assessments/functional-independence-measure-fim/ [Accessed 16 June 2025].

Zhang, S., Xie, H., Wang, C., Wu, F. and Wang, X., 2022. Effectiveness of physiotherapy to promote motor recovery in individuals with stroke: a systematic review protocol.

Zhuo, Y., Qu, Y., Wu, J., Huang, X., Yuan, W., Lee, J., Yang, Z. and Zee, B., 2021. Estimation of stroke severity with National Institutes of Health Stroke Scale grading and retinal features: A cross-sectional study. Medicine, 100(31), p.e26846. https://doi.org/10.1097/MD.0000000000026846

Ziu, E., Kishner, S.Z. and Mesfin, F.B., 2017. Subarachnoid hemorrhage. In: StatPearls [online]. Treasure Island (FL): StatPearls Publishing. Available at: https://www.ncbi.nlm.nih.gov/books/NBK441876/ [Accessed 16 June 2025].

Zurawski, E., Behm, K., Dunlap, C., Koo, J., Ismail, F., Boulias, C., Reid, S. and Phadke, C.P., 2019. Interrater reliability of the Modified Ashworth Scale with standardized movement speeds: A pilot study. Physiotherapy Canada, 71(4), pp.348–354.

APPENDICES

APPENDIX I

INFORMED CONSENT FORM

You are invited to take part in this web-based online survey titled: Knowledge and Utilization of Stroke Assessment Scales among Neurological Physiotherapists in Selected Hospitals in Benin City, Edo State. This is a research project being carried out by Oluwaponmile Praise Ayomide, a 500 level physiotherapy student in the College of Basic Medical Sciences at the University of Benin.

Your participation is voluntary and you can refuse at any time. You will be able to answer within 3 minutes. There is no associated risk with taking part in this study. The survey distribution will be physically done through a printed questionnaire. Identifiers such as your name, phone number or email address will not be required to complete this questionnaire.

You may contact this researcher, Oluwaponmile Praise at oluwaponmilepraise @gmail.com if you have any questions about the study or its processes at any time.

_____ _____

RESPONDENTS' SIGNATURE RESEARHERS' SIGNATURE

APPENDIX II

Questionnaire on Standardized Outcome Measures in Rehabilitation

Socio-demographic and Professional Information

Please provide the following details about yourself.

- Gender:
  [ ] Male

  [ ] Female

- Highest Educational Qualification:
  [ ] BSc

  [ ] DPT

  [ ] MSc

  [ ] PhD

  [ ] Other (Please specify): _____

- Years of Practice as a Physiotherapist:
  [ ] < 5 years

  [ ] 5-10 years

  [ ] 11-15 years

  [ ] 16-20 years

  [ ] > 20 years

- Primary Place of Practice (Institution):
  [ ] University of Benin Teaching Hospital

  [ ] Edo Specialist Hospital

  [ ] Fortune Physiotherapist Clinic

  [ ] Other (Please specify): _____

- Rank:
  [ ] Physiotherapist

  [ ] Senior Physiotherapist

  [ ] Principal Physiotherapist

  [ ] Chief Physiotherapist

  [ ] Director / Assistant Director

[ ] Other (Please specify): _____

Part B: Knowledge of Stroke Assessment Scales

Please indicate your level of **familiarity** with the following standardized stroke assessment scales.

Scale	Not Familiar	Barely Familiar	Quite Familiar	Very Familiar
BODY FUNCTION AND STRUCTURE				
NIHSS				
Modified Ashworth Scale (MAS)				
Mini mental State Examination (MMSE)				
Fugl-Meyer Assessment Scale (FMA)				
Benin Stroke Scale (BSS)				
ACTIVITY				
Barthel Index (BI)				
Berg Balance Scale (BBS)				
6 Minutes Walk Test (6MWT)				
10 Minutes Walk Test (10MWT)				
ACTIVITY AND PARTICIPATION				
Modified Rankin Scale				

(mRS)				
Functional Independence Measure (FIM)				
Stroke Impact Scale (SIS)				
Stroke specific Quality of Life (SS-QoL)				
Medical Outcome Study short form (SF – 36)				
PARTICIPATION				
Life – H (Assessment of Life)				

Part C: Utilization of Stroke Assessment Scales

Please indicate how **frequently** you use the following standardized stroke outcome measures in your clinical practice.

Scale	**Never**	**Rarely**	**Sometimes**	**Often**	**Frequentl y**
BODY FUNCTION AND STRUCTURE					
NIHSS					
Modified Ashworth Scale (MAS)					
Mini mental State Examination (MMSE)					
Fugl-Meyer Assessment Scale (FMA)					
Benin Stroke					

Scale (BSS)					
ACTIVITY					
Barthel Index (BI)					
Berg Balance Scale (BBS)					
6 Minutes Walk Test (6MWT)					
10 Minutes Walk Test (10MWT)					
ACTIVITY AND PARTICIPATION					
Modified Rankin Scale (mRS)					
Functional Independence Measure (FIM)					
Stroke Impact Scale (SIS)					
Stroke specific Quality of Life (SS-QoL)					
Medical Outcome Study short form (SF – 36)					
PARTICIPATION					
Life – H (Assessment of Life)					

ETHICAL APPROVAL