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ORIGINAL ARTICLE

The Use of Functional Outcome Measures in Stroke Rehabilitation among Physiotherapists in Klang Valley, Malaysia.

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Abstract
The use of functional outcome measures (OMs) in physiotherapy practice is widely recommended for monitoring stroke patients' functional status and is considered an integral component of rehabilitation. The aim of this study is to: (1) determine the utilization rate of functional OMs in stroke rehabilitation; (2) evaluate the relationship between OM usage with work experience, level of education, and facility recommendations; and (3) identify common barriers and facilitators affecting the use of functional OMs among physiotherapists. A cross-sectional online survey was conducted among physiotherapists currently employed in private healthcare settings in Klang Valley. The result showed that 97.7% of participants acknowledged using functional OMs when managing stroke patients. Facility recommendations showed a significant association with OM utilization frequency (p-value = 0.001). However, years of working experience and educational status did not show a significant relationship with the frequency of use. Participants' positive attitudes toward the use of functional OMs, their belief in the value of OMs, and the perception that OM enable ideal clinical assessment were identified as the main facilitators. The main barriers included a lack of familiarity with OMs and a preference for using impairment OM. This study concludes that most physiotherapists in private facilities in Klang Valley use functional OMs in stroke rehabilitation, and facility recommendations serving as a significant driver for OM adoption.

Keywords: *Functional status, outcome measure, physiotherapist, private facility, stroke.*

Introduction

Stroke is an emergency medical condition characterized by an acute compromise of cerebral perfusion or vasculature [1]. The definition of stroke continues to evolve, as the traditional clinical definition does not fully account for advancements in scientific and technological [2]. In many countries, stroke is a leading cause of death and disability. In Malaysia, it is the third leading cause of death, accounting for 8.0% of deaths in 2019 compared to 7.9% in 2018 [3]. An empirical analysis of stroke in Malaysia revealed a concerning rise in stroke incidence among younger Malaysians, with more than 45% increase in cases among those under 65 years old. According to WHO, rehabilitation is defined as a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment [4]. Rehabilitation plays a crucial role in improving patients' functional level by maximising their physical capacity, minimising secondary illness progression, optimising their environment, easing psychological adaptation to impairment, and encouraging social integration. Within the constraints of persistent stroke deficits, the fundamental goals of stroke rehabilitation are to prevent deterioration, enhance motor function recovery while achieving the best feasible level of independence [5]. The growing number of stroke cases in Malaysia exhibits a great need for physiotherapists to support with rehabilitation and maximise functional independence in stroke-affected patients. There is a rising demand for health practitioners around the world to be more accountable, including demonstrating that their practice is evidence-based and ensuring reliable metrics are utilised to assess the results of their interventions [6]. The use of outcome measure (OM) in physiotherapy practice has been widely recommended to monitor patients' functional status over time. It is commonly advocated as an integral part of rehabilitation. A comparison of outcome measure (OM) usage between physiotherapists in a developed country (Canada) and a developing country (India) revealed that Indian physiotherapists reported a higher frequency of standardized OM use (96.7%) compared to their Canadian counterparts (89.2%)[7]. In neurological physiotherapy, minor changes in impairment can lead to significant functional improvements, substantially impacting patient's quality of life.

In stroke rehabilitation, external monitoring has traditionally focused on structural aspects of care such as impairment assessment, as these are easier to quantify. Recently, however, there has been a shift toward assessing care processes and functional outcomes, in alignment with the International Classification of Functioning, Disability and Health (ICF) framework [8]. With the use of the ICF concept, the focus has tremendously shifted to patient-centred care as OM selections are based on the ICF framework to measure activity restrictions and quality of life beyond the diagnosis of a patient, therefore treating a patient holistically [9]. WHO has argued that patient improvement goals should consider patient's capacity to function and carry out everyday tasks like sitting, turning, walking, and so forth, in addition to the conventionally evaluated impairment associated with body structure.

The adoption of standardised OM has been partially spurred by the recognition that patient progress must be evaluated based on functional performance, not just conventional impairment measures (e.g., strength, range of motion). Functional outcome data is critical, as improvements in daily activities do not always correlate directly with changes in impairments [10]. While improving disability is important, the main goal of rehabilitation is to maximise functional independence. As mentioned by Veras et al. (2016) [11], evidence-based physiotherapy (EBP) is becoming more popular and standardised OMs are an integral part in neurological rehabilitation [12]. Malaysian physiotherapists have shown a positive attitude toward EBP and a willingness to integrate evidence into clinical practice. Since EBP relies on five core components, including outcome evaluation, standardised measures are vital for

assessing intervention efficacy [13]. Selecting appropriate OMs helps to detect subtle functional changes, fostering continous improvement. This study will focus on evaluating physiotherapists' use of functional OM related to activities of daily living (ADLs), functional status, gait, balance, endurance, and other key domains in stroke rehabilitation.

Materials and methods

Design

This cross-sectional study employed an online survey to assess the current use of functional OM among physiotherapists in Klang Valley. Ethical approval was obtained from the Institutional Research and Ethics Committee of KPJ Healthcare University College.

Sampling

Participants were recruited via convenient sampling and included physiotherapists with experience treating stroke patients. They were drawn from private hospitals and selected physiotherapy centres in Klang Valley that provide stroke rehabilitation. The exclusion criteria were physiotherapists with no experience treating stroke patients in the last 6 months**.** The sample size (S) was calculated using the Krejcie and Morgan table [14], with a population proportion of 0.5. Based on this formula, the target sample size was 210 physiotherapists, including a 20% dropout allowance. All identified physiotherapy departments in private hospitals and centres were contacted via phone numbers obtained through Google searches. Several methods were utilized to collect participants for the quantitative phase. One method was to obtain the contact information for the head of department (HOD) of some of the facilities, and a survey link was sent to them to be distributed to their staff. Besides, using social media and common contacts, participants were approached specifically seeking diversity in years of practice and type of environment (e.g., private hospital and private centre), to solicit their involvement. In addition to word-of-mouth marketing and direct distribution via emails and text messages, the online survey was promoted on many social media platforms via the pages of the Malaysian Physiotherapist and Malaysian Physiotherapy Association. To guarantee that respondents to this survey were Klang Valley workers affiliated with private physiotherapy centres, information was provided on the survey header page.

Data collection tool

The instrument tool used was a modified questionnaire from two previous studies: Agyenkwa et al. (2020) [15] in Ghana and Swinkels et al. (2011) [16] in the Netherlands, which assessed the use of OMs for stroke patients among physiotherapists. Using data from the earlier studies, a 34-item questionnaire was created to assess the practice of functional OMs for stroke patients among physiotherapists in Klang Valley. The questionnaire consisted of three parts: part one consisted of 5 questions that captured information on the demographics of the participants such as age, gender, level of education, years of working experience, and type of facility they are attached to. The second part of the questionnaire consisted of 4 questions assessing the routine details of the use of functional OMs among physiotherapists with stroke patients. The questions included whether participants used functional OM, frequency of usage, types of functional OM used, and if their facility recommended the use of OM. The final section was on barriers and facilitators in the use of functional OM during practice among physiotherapists and it consist of 25 questions based on the Likert scale scoring. Content validation was conducted among six specialists from a pool of academicians and clinicians with more than ten years of expertise in stroke rehabilitation and concluded that the content validity of the modified questionnaire was very acceptable. A pilot survey with a sample size of 21 was carried out to establish the reliability of the developed questionnaire, before full scale distribution.

Data collection procedure

The study was conducted from June to November 2023, with data collection spanning 24 weeks. Following questionnaire validation and pilot testing, an online version was created and distributed via a web URL. One representative from each clinical setting facilitated distribution to their physiotherapy colleagues. The Google Form link was disseminated through multiple channels to maximize participation among Klang Valley practitioners. The survey's homepage included the study objectives, investigators' information and data collection period details. Regular reminders were given to encourage completion. All submitted questionnaires underwent manual verification to ensure complete responses.

Data analysis

Collected data was analysed using the Statistical Package for the Social Sciences (SPSS) version 28.0. Descriptive statistics were employed to analyse the utilisation patterns of functional OMs and reported facilitators and barriers to OM implementation. For inferential analysis, multifactorial ANOVA was conducted to examine relationships between functional OM usage and years of clinical experience and educational qualification level.

Results

The study achieved an 82% response rate, with 172 participants completing the survey out of the target sample size of 210. Table 1 displays the demographic information of participants. There were 124 female (72.1%) and 48 (27.9%) male participants. Exactly 129 (75%) of the participants were degree holders, followed by 22 (12.8%) were qualified with Masters, and 21 participants (12.2%) were diploma holders. In terms of workplace, the number of participants working in the private hospital and centre was almost equally distributed, with 90 of the participants (52.3%) attached to hospitals and the remaining from physiotherapy centres. Most participants (76%) reported 1- 8 years of professional experience.

Level of functional outcome measure use

Table 2 presents the patterns of functional OM use among participating physiotherapists. Key findings include 168 participants (97.7%) reported using functional OM for stroke patients, while only 4 participants (2.3%) indicated non-use. In terms of frequency of use, more than 30% employed functional OM for every five stroke patients they encounter regularly. A mere 2% reported never using functional OM out of the 5 patients seen, which was probably among those who did not utilize the functional OM in their practice. The Berg Balance Scale (BBS) was the most frequently used functional outcome measure (38.4%), followed by the Motor Assessment Scale (MAS) (32%). A significant number of respondents, 168 (97.7%), stated that their facility advocated using outcome measurements in patient care.

Relationship of Work Experience, Level of Education and Facility Recommendation with the Use of Functional OM

Multifactorial ANOVA was performed to determine the effect on the relationship of years of working experience, educational level, and facility recommendation with the frequency of practice functional OM among physiotherapists. Facility recommendation showed a statistically significant influence on OM utilization frequency ($p = 0.001$). However, years of working experience and educational status showed no significant effects on the frequency of OM utilization ($p > 0.05$). The result is summarized in Table 3.

Barriers and Facilitators in using Functional OM

Table 4 lists the factors that encourage physiotherapists to use OM, while Table 5 lists the obstacles to using functional OM as perceived by the participants. It is observed that most participants generally agreed with most of the facilitators listed in the questionnaire, with the

largest proportion of facilitator (85.5%) suggesting having a positive attitude towards employing functional OM. The other two most common facilitators, which were cited by more than 80% of the participants, were the value of functional OM is convincing to the participants, and most of the participants' belief that functional OM enables balanced clinical assessment during stroke rehabilitation. In terms of participants' thoughts on the facilitators, there were minimal disagreement, however, most of the participants disagreed that there was enough OM available in their clinical practice, accounting for the largest percentage of disagreement (9.3%). Primary barriers identified were the knowledge gaps with the majority (79.7%) expressed desire to learn more about functional OM before using it for patient care and therefore limiting their use. Another was that the majority (62.8%) preferred to utilise impairment-based OM rather than functional OM while managing stroke patients. Analysis of the barriers found indicates that the majority of participants do not strongly oppose using OM (73.3%) and do not believe that utilising OM is restricted because of a lack of training (58.7%).

Discussion

This study reveals widespread adoption of functional OMs among experienced physiotherapists in Klang Valley, with 97.7% reported using functional OMs during stroke rehabilitation. This finding, align with a study in Sri Lanka [17], suggesting a regional trend toward evidence-based practice in developing healthcare systems. The adoption rate exceeds figures from Colombia (87%) [18] and Korea (84.1%) [19], but significantly surpasses Ghana's reported 47.6% utilization [15], where facility-level recommendations for OMs were notably absent.

Approximately 80% of participants in this study were under the age of 35, and 75% possessing Bachelor’s degrees, suggesting that younger people are more open to utilizing functional OM. Bogahawatta et al. (2022) [17] discovered similar findings with younger participants, which suggested that they were more likely to be familiar with pertinent theories and useful advice regarding the use of OM. These results imply that the foundation of evidence-based practice, which include the use of outcome measurements, are the focus of contemporary physiotherapy education. Nonetheless, a study in Saudi Arabia [20], revealed that physiotherapists with 6 -10 years of experience, were 2.7 times more likely to use OMs. The findings were similar to this study as the majority of participants were of age 26 - 35 years. This study also revealed that younger physiotherapists maintain high implementation rates (75.6% use OMs for ≥3/5 patients), reinforcing Malaysia's EBP-positive culture [13]. However, in Ghana, the frequency of use appears to be lower, with less than 30% of physiotherapists using OM for at least 4 out of their 5 patients [15]. This may reflect the different level of awareness and knowledge of Ghanaian physiotherapists on the importance of OM.

To support excellent clinical practice and service delivery in rehabilitation, continual quality management depends on standardized reporting of functioning data [21] and tracking the functional outcomes of patients. The most reported used functional OM for stroke patients was the BBS (38.4%), followed by MAS (32%), MBI (Modified Barthel Index) (9.9%), and TUG (Timed Up and Go) (8.7%). The BBS is the second most often used functional OM behind the Tinetti Mobility Index and Functional Independence Measure (FIM), according to a similar study done in Columbia [18]. Both the latter options, however, were left off from this study's questionnaire because they are not included in the core set of suggested metrics for stroke therapy [22].

The BBS's psychometric qualities for stroke rehabilitation application is a valuable and simple test to conduct without requiring costly equipment or a lengthy assessment period, also indicating that the test has strong reliability, validity, and responsiveness to change [23]. This

could have had an impact on the high rate of BBS use among physiotherapists and assist in evaluating the balance risk among stroke patients because maintaining a stroke patient's mobility and ability to engage in daily function depends on measuring and tracking their postural balance and fall risk [24]. Besides that, the implementation of the most widely recommended tools (e.g., BBS, MAS, TUG) is feasible due to several factors: these tools are easy to score, free to use, and require no specialized training or equipment [25].

The relationship between physiotherapists' work experience, education level, and facility recommendations regarding the use of functional OM was evaluated to assess how these factors might influence clinical practice. In this analysis, only facility recommendations showed a significant association with the frequency of functional OM use among physiotherapists. This finding aligns with a Ghanaian study [15], which reported higher OM usage in facilities where their use was recommended compared to those without such recommendations. Similarly, a German study [26] identified organizational limitations as a key barrier to OM adoption, while another study [27] highlighted the importance of organisational and peer support in facilitating routine outcome measurement.

In contrast, the frequency of functional OM use did not correlate with years of experience or educational level. This contradicts with previous research, such as a study [28] found that educational level may be a predictor of using EBP. Another study [29] found that physiotherapists with a master's qualification were more likely to use OM, possibly due to greater involvement in research and deeper familiarity with outcome measures. Additionally, a German study [26] reported that university degree holders were more likely to use OMs regularly, with 70% of the study's participants were diploma holders. However, the current study did not replicate this finding, possibly due to the overrepresentation of bachelor's degree holders and underrepresentation of diploma or master's-level qualifications.

During facilitator evaluation , most respondents (85.5%) reported having a favourable attitude towards OM, and 80.2% of them were convinced of the usefulness, which is consistent with prior research [20,30]. Positive attitudes and perceived value of using standardised OMs were also found to be strong facilitators in a Saudi Arabian study [31] on neurophysiotherapists. However, the authors speculate that this might reflect high baseline knowledge, which may not echo the results of this study.

Despite 76.2% reporting familiarity with functional OMs and 70.9% feeling confident in their skills, 79.7% desired further training, suggesting knowledge gaps remain. A Dutch study noted that while physiotherapists had a positive attitude and were persuaded of the benefits of OMs, inexperience in implementation was a major barrier [16]. Additionally, 66.7% of participants preferred impairment-based OM, potentially limiting functional OM adoption. This preference may stem from historical reliance on basic impairment measures (such as range of motion, strength, muscular tone, pain, etc.) in rehabilitation, which poorly correlate with activity/participation outcomes [32]. In Egypt, physiotherapists adopted EBP at a lower rate (8.1%) in the neurology specialty than in musculoskeletal diseases [33]. This is likely due, in part, to the long-standing curricular inclusion and widespread use of impairment measures in rehabilitation syllabuses. Though time restriction has been concluded as one of the main barriers in several studies [19,31,34], Malaysian physiotherapists in this study did not perceived time as a hindrance to their use of OM, likely because the study was conducted in private rather than public settings, with lower patient volumes, allowing adequate time for OM administration.

This is the first study focusing on private practice settings in Malaysia, revealing overwhelmingly positive attitudes towards OMs in stroke rehabilitation despite some barriers. This result corresponds similarly with another Malaysian study [13], in which 57.8% of respondents endorsed EBP as essential to their daily work,

while 60.8% agreed it was necessary for providing higher-quality patient care. This study highlights that while Malaysian physiotherapists broadly support use of functional OMs in stroke rehabilitation, clinical adoption varies by setting. Facility recommendations appear influential, suggesting they could serve as a guideline to promote OM use. Future research should expand to government hospitals and community clinics across Malaysia, involving all physiotherapists treating stroke patients. Such studies would enhance understanding of OM utilization and inform strategies to bridge the gap between evidence and practice.

Conclusion

The results of this study provide insight into the level of functional OM use among physiotherapists specialising in stroke rehabilitation. The majority of private physiotherapists uses functional OM with at least 3 out of 5 patients with stroke. Facility recommendation appears to be the factor most strongly associated with functional OM use.

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Authors' Contributions

RR conceptualised and designed the study, performed data collection and analysis, and drafted and finalised the manuscript. MIMS and SNB contributed to research methodology, data analysis, manuscript editing, and resources for the study. AKK contributed to data analysis and review of the manuscript.

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Table 1. Descriptive analysis for demographic data of participants (N = 172)

Parameters		**Frequency (n)**	**Percentage (%)**
Gender			
	Female	124	72.1
	Male	48	27.9
Age			
	Under 25	22	12.8
	26 –35	117	68.0
	36–45	24	14.0
	46–55	7	4.1
	56 and above	2	1.1
Education Status			
	Diploma	21	12.2
	Degree	129	75.0
	Master	22	12.8
Work Place (Private)			
	Hospital	90	52.3
	Physiotherapy centre	82	47.7
Work Experience			
	≤ 8	113	65.7
	9–16	45	26.2
	17–24	6	3.5
	25–32	6	3.5
	≥ 33	2	1.1

Table 2. Routine details on functional outcome measurement use among participants

Parameters		Frequency (n)	Percentage (%)
Total Respondents (N= 172)			
Use of OM			
	Yes	168	97.7
	No	4	2.3
Frequency of OM Use			
	0 out of 5	4	2.3
	1 out of 5	18	10.5
	2 out of 5	20	11.6
	3 out of 5	40	23.3
	4 out of 5	25	14.5
	5 out of 5	65	37.8
Commonly used OM			
	Berg Balance Score (BBS)	66	38.4
	Motor Assessment Scale (MAS)	55	31.9
	Modified Barthel Index (MBI)	17	9.9
	Timed Up and Go	15	8.7
	6-Min Walk Test	10	5.8
	Others	5	3.0
	None	4	2.3
Facility Recommendation			
	Yes	168	97.7

Table 3. Relationship between frequency of use with years of working experience, educational status, and facility recommendation in the practice of functional outcome measure among physiotherapist

	SS (Sum of Square)	df	MS (Mean Square)	F	Sig	Partial Eta Squared
Frequency of Use Functional Outcome Measure						
Years of Working Experience	47.690	34	1.403	0.628	0.942	0.138
Educational Status	7.777	3	2.592	1.161	0.327	0.026
Facility Recommendation	24.099	1	24.099	10.797	0.001	0.075

Using Multifactorial ANOVA for having three independent variable and numerical dependent variables

*Significant at $p < 0.005$

Table 4. Common facilitators towards using functional OM among participants

Factors	Perception, n (%)		
	Strongly Disagree/ Disagree	Neutral	Strongly Agree/ Agree
Facilitators			
Familiarity with functional OM	10 (5.8)	31 (18.0)	131 (76.2)
Sufficient Skills to apply	8 (4.7)	42 (24.4)	122 (70.9)
Positive attitudes towards OM	5 (2.9)	20 (11.6)	147 (85.5)
Patient value use of OM	8 (4.7)	37 (21.5)	127 (73.8)
Co-workers (physiotherapists) support the use of OMs	10 (5.8)	49 (28.5)	113 (65.7)
Supervisors supports the use	7 (4.1)	35 (20.3)	130 (75.6)
The use of OMs fits my way of working in the clinic well	8 (4.7)	38 (22.0)	126 (73.3)
Sufficient availability of OMs in daily clinical practice	16 (9.3)	52 (30.2)	104 (60.5)
OMs allow to make a balanced clinical assessment	3 (1.8)	31 (18.0)	138 (80.2)
Convinced of the usefulness of Oms	3 (1.8)	31 (18.0)	138 (80.2)
Use of OMs is an integral part of treatment	7 (4.1)	36 (20.9)	129 (75.0)
Use of OMs improves the quality of my treatment	7 (4.1)	31 (18.0)	134 (77.9)
Patients want to evaluate treatment results objectively	4 (2.3)	36 (21.0)	132 (76.7)
Referrers want to evaluate treatment results objectively	5 (3.0)	35 (20.3)	132 (76.7)
Using OMs might strengthen negotiations with insurers	7 (4.1)	45 (26.1)	120 (69.8)
I use OMs primarily for evaluative purposes	5 (2.9)	42 (24.4)	125 (72.7)

Table 5. Common barrier towards using functional OM among participants

Factors	Perception n (%)		
	Strongly Disagree/ Disagree	Neutral	Strongly Agree/ Agree
Barriers			
Difficulty in changing routine	58 (33.7)	74 (43.0)	40 (23.3)
Resist using Oms	126 (73.3)	32 (18.6)	14 (8.1)
Patients find use of OM time consuming	73 (42.5)	62 (36.0)	37 (21.5)
Using OMs is a problem because no training	101 (58.7)	44 (25.6)	27 (15.7)
Using OM is problem do not have physical space in practice	93 (53.5)	47 (27.3)	33 (19.2)
To know more about OMs before using	6 (3.4)	29 (16.9)	137 (79.7)
Using OMs requires additional financial compensation	101 (58.7)	50 (29.1)	21 (12.2)
Only primarily use impairment-based OMs	24 (14.0)	40 (23.2)	108 (62.8)
Using OM too time consuming	72 (41.9)	59 (34.3)	41 (23.8)

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