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Current knowledge and practice of post-stroke unilateral spatial neglect rehabilitation: a national survey of Nigerian physiotherapists

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Abstract

Background Unilateral spatial neglect (USN) is a leading cause of disability and handicap in stroke survivors affecting functional recovery. Therapists' knowledge and practice in post-stroke unilateral spatial neglect are key to the success of rehabilitation.

Aim This study aimed to evaluate physiotherapists' knowledge of USN and the current practice of USN management.

Method A cross-sectional study was undertaken among Nigerian physiotherapists (N=240). An online structured questionnaire that assessed respondents' knowledge, current practice, barriers, and enablers to post-stroke USN rehabilitation was administered.

Results The total knowledge score was 12.6 ± 4.75 on a scale of 25. Few physiotherapists (7.92%) demonstrated good knowledge of USN. Postgraduate certification (p = 0.001), clinical practice setting (p = 0.008), and working full time in neurorehabilitation (p = 0.033) were significantly associated with the therapist's knowledge of USN. There was a nonsignificant positive correlation between the duration of practice in the neurorehabilitation setting (r = 0.02; p = 0.854) and USN knowledge. A nonsignificant minimal negative correlation between practice as a physiotherapist (r = -0.02; p = 0.772) and USN knowledge was also noted. The age of physiotherapists showed no linear relationship with the therapist's knowledge of USN (r = -0.00; p = 0.992). Constraint-induced movement therapy (86.47%) was the most commonly used USN treatment, while Albert's test (49.37%) was the most utilized screening tool for USN.

Conclusions Very few physiotherapists had good knowledge of USN. Participants' knowledge increased as they attained higher education levels relating to neurological physiotherapy. These findings emphasize the need for specialist rehabilitation training for physiotherapy practice.

Keywords Nigeria, Stroke rehabilitation, Physiotherapist, Unilateral spatial neglect, Cross-sectional survey

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Introduction

About 50–70% of individuals surviving right hemispheric stroke will experience a perceptual disorder known as post-stroke unilateral spatial neglect (USN) [1-3]. Unilateral spatial neglect is defined as "the inability to report, respond or orient to meaningful stimuli presented to the side opposite the brain lesion" [4]. Unilateral spatial neglect is a leading cause of disability and handicap in



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stroke survivors affecting functional recovery and associated with poor rehabilitation outcomes [1, 5–7] and is a strong predictor of post-stroke recovery [8, 9].

A variety of rehabilitation techniques for USN rehabilitation has been explored in the past [10]. Despite the plethora of available evidence, however, there seems to exist a knowledge-to-practice translation gap, with a lack of uptake of evidence-based practices in clinical decision-making for post-stroke rehabilitation [11]. Physiotherapists are no exception despite the significant increase in knowledge and skills in the physiotherapy profession both in academic curricula and in clinical practice [12]. Physiotherapists are healthcare professionals trained to provide rehabilitative care in a wide range of disabling conditions to restore, maintain, and promote function in persons with activity limitations and participation restrictions [13]. However, poor knowledge and skills about a specific condition pose a strong barrier to implementing a guideline for effective stroke rehabilitation [14-16]. Identification of barriers to practice is fundamental in the process of translating knowledge into practice [17]. Sadly, there is a substantial gap between evidence-based practices and current actual practice in stroke rehabilitation [15]. This evidence-practice gap may arise because of systemic, team, or individual barriers to change. These barriers may include a lack of knowledge and skills, negative or outdated attitudes, or inefficient systems which consequently affect practice [14, 18]. Practice guidelines for stroke rehabilitation, and thus USN treatment, are available globally [19-22].

However, the treatment of USN is unclear clinically, given the accumulating evidence showing USN's impact on stroke and brain injury survivors. There is a dearth of empirical or anecdotal studies investigating adherence to practice guidelines for USN treatment in stroke survivors attending rehabilitation clinics. The certitude that USN is underdiagnosed in clinical settings [23, 24] portrays that not all clinicians who provide care to patients with stroke have sufficient knowledge and/or rarely assess patients for USN. Survey studies in the UK, Australia, and the USA have explored the theoretical beliefs underpinning the current practice of stroke rehabilitation [25-30]. However, two studies in the USA [31, 32] evaluated treatment approaches specific to post-stroke unilateral spatial neglect. In Nigeria, stroke rehabilitation practices involve conventional approaches consisting mostly of the Bobath and Bruunstrom techniques [33]. Hamzat and colleagues [34], in a regional survey, reported that neglect was observed in 37% of stroke patients. Nigerian physiotherapy training has evolved. However, physiotherapy training in Nigeria is targeted at producing generalist and not specialist physiotherapists. Although postgraduate programs in physiotherapy abound, these programs are aimed at reinforcing clinical critical reasoning and research competencies. Despite the plethora of treatment options suggested for the treatment of stroke-specific perceptual disorders such as unilateral spatial neglect, it is unclear if these pieces of evidence are available and integrated into clinical practice. Physiotherapists' knowledge about post-stroke USN rehabilitation, current clinical practices, and the barriers and enablers they encounter in practice are very important when planning treatment, informing health policies, and conducting continued education programs. Also, physiotherapists' knowledge and current practice of USN may provide prospective answers to questions that have not been answered by research and insights into the gap between research and clinical practices. To the best of our knowledge, no study has evaluated physiotherapists' knowledge, current practices, barriers, and enablers to post-stroke USN rehabilitation. Therefore, with the foregoing in mind, this study was conceptualized to evaluate physiotherapist's knowledge, current self-reported practice, barriers, and enablers to post-stroke USN rehabilitation among Nigerian physiotherapists.

Materials and methods

Study design

A cross-sectional survey of physiotherapists who provide services to stroke survivors in neurological units in Nigeria were conducted from November 2018 to June 2019. A convenient sampling technique was used to recruit consenting physiotherapists for this study. The exclusion criteria for this survey were the following: (i) intern physiotherapists and (ii) physiotherapists who were not licensed by the medical rehabilitation and therapist board of Nigeria. The inclusion criteria are as follows: (i) Physiotherapists who are members of any of the two physiotherapy professional associations in Nigeria and (ii) physiotherapists currently working in neurology units.

Sample size

A sample size of 153 physiotherapists was calculated statistically using an 80% power and a 5% confidence limit and 50% hypothesized frequency of outcome (estimated at 50% to reflect the assumption that 50% of the population would have a good knowledge of USN) [35] based on the 2038 physiotherapists listed in the MRTB register.

Participants

The study participants were Nigerian physiotherapists currently providing stroke rehabilitation services in neurology units either in the private or the public health sector.

One-thousand five-hundred (1500) physiotherapists (the number of physiotherapists currently active on the

MRTB list) were contacted through the Medical Rehabilitation and Therapist Board (MRTB), a federal agency that regulates physiotherapists and other rehabilitation professionals in Nigeria's database. This number, however, differs from the 2013 bulletin of the Medical Rehabilitation Therapist Board (MRTB) of Nigeria, which listed 2038 licensed physiotherapists [36]. However, recent literature has indicated that about half of the licensed physiotherapists in Nigeria are likely to emigrate to another country [37]. More so, the MRTB's list did not indicate whether the licensed physiotherapists were currently practicing in Nigeria or providing stroke rehabilitation services in neurology units. As a result, we could not completely rely on the MRTB list to determine how many physiotherapists were currently practicing in the country. Therefore, we approached the two physiotherapy associations: the Nigerian Society of Physiotherapists (NSP) and the Association of Clinical and Academic Physiotherapists of Nigeria (ACAPN) to grant us access to the database of their members with a special interest in neurological physiotherapy, and these were contacted to compliment the MRTB list.

Data collection tool

The instrument for this study was a questionnaire on knowledge, current practice, barriers, and enablers to unilateral spatial neglect. The questionnaire was validated by experts in questionnaire design and experts in stroke rehabilitation and was also pilot tested on eight consenting clinicians in stroke rehabilitation. The questionnaire took approximately 15-20 min to complete and consists of four sections (sections A to D). Section A comprises questions on respondents' demographic characteristics. Section B contains 25 items for assessing the participants' knowledge of USN. It was adapted from a previous study by Petzold and colleagues [18] which comprised questions on (i) USN problem identification, (ii) USN assessment use, (iii) USN intervention use, and (iv) knowledge of USN and best practice recommendations including the anatomy of neglect. Each item had three responses ("agree," "disagree," or "undecided"). The maximum score was 25, and the minimum score was 0. An "agree" response to a correct statement was scored 1, and a "disagree" response to a wrong statement was also scored 1. In the same vein, a "disagree" response to a correct statement was scored 0, and an "agree" response to a wrong statement was also scored 0. An "undecided" response was disregarded. The scores where ranked as follows: <10 indicates poor knowledge USN, 10-19 implies moderate knowledge, and 20-25 connotes good knowledge. This ranking was essentially for the determination of the level of knowledge among the participants and was not for inferential statistics. Section C assessed the physiotherapist's current practice of USN. The questions are structured to decipher the current assessment strategy, treatment approach, referral, or teamwork in the treatment of post-stroke USN. Lastly, section D contained multiple-choice questions on enablers and barriers already identified in the literature on stroke rehabilitation [16, 38]. The questions on barriers consisted of therapist, institutional, client suitability, and equipment factors. Item-by-item responses as well as the summed scores for knowledge were presented. Therapists were asked to rate the barriers or enablers to the treatment of post-stroke unilateral spatial neglect on a scale of 1-5 with 1 being the greatest barrier or enabler and 5 denoting the least barrier or enabler. The scoring was done such that 1-2 were major barriers or facilitators, 3 were moderate barriers or facilitators, and 4-5 were minor barriers. The interclass correlation of this questionnaire (α) yielded 0.93, 0.72, and 0.64 for sections B, C, and D, respectively.

Data collection procedure

Study data were collected and managed using REDCap (Research Electronic Data Capture), an electronic data capture tool hosted at the University of Witwatersrand [39].

REDCap is a secure, web-based application designed to support data capture for research studies. A survey link containing the study questionnaire was sent to physiotherapists' telephone numbers (n = 1500) by the Medical Rehabilitation and Therapist's Board of Nigeria. Similarly, interest groups (neurology) of the Nigerian Society of Physiotherapists (n=97) and the Association of Clinical and Academic Physiotherapists of Nigeria (ACAPN) (n=49) also received the survey link. Hard copies of the questionnaire (n=46) were also distributed at the 2018 Nigeria Federation of Neurorehabilitation Congress in Ibadan, Nigeria. Reminders were sent to the respondents every 3 weeks, and the data collection for this study spanned from November 2018 to August 2020. Out of the total 1692 physiotherapists invited to participate in the survey, 498 responded, yielding a response rate of 29.43%. Two-hundred and forty (48.19%) out of the 498 respondents completed the questionnaire, but 170 (70.83%) respondents indicated they provided stroke rehabilitation services in neurology units. Figure 1 shows the flow of respondents.

Survey analysis

The data were analyzed using IBM SPSS Statistics for Macintosh, Version 25.0. (IBM 2017). Continuous data were summarized using means and standard deviations, while categorical data were summarized using frequencies and percentages. Inferential statistics were used to examine relationships between demographic characteristics of the main outcome measure (knowledge of



Fig. 1 Flow diagram illustrating respondents selection process. **MRTB, Medical Rehabilitation and Therapist Board; ACAPN, Association of Clinical and Academic Physiotherapists of Nigeria; NFNR, Nigerian Federation for NeuroRehabilitation; NSP, Nigeria Society of Physiotherapy

USN): Spearman rank correlation was used to compare the medians of continuous variables (age, years of practice) that were not normally distributed, while student *t*-test was used to compare the means of continuous variables of variables that were normally distributed. ANOVA test was used to establish the relationship between categorical variables. Significance level of 0.05 was used. Item-by-item responses as well as the summed scores for knowledge were presented.

Ethical considerations

Ethical clearance was obtained from the University of the Witwatersrand Committee for Research on Human subjects (Approval Number M180155). Also, permission to conduct this study was obtained from the National Research Ethics Committee of Nigeria (approval number NHREC/01 January 2007–30 July 2018) and the Medical Rehabilitation and Therapist Board of Nigeria.

Results

Respondents' characteristics

The majority of respondents were male (n = 145, 60.66%) with a median age of 32 years (IQR 23–68). One-hundred and fifteen (48.12%) of the respondents had an entry-level bachelor's degree, 164 (68.62%) worked mostly in a hospital setting, and 62 (26.16%) had postgraduate certification in neurological physiotherapy. The respondents' characteristics are presented in Table 1.

Physiotherapists' knowledge of unilateral spatial neglect

The average knowledge score was 12.6 ± 4.75 on a scale of 24. Seven physiotherapists (7.92%) demonstrated good knowledge of USN, while the majority had moderate knowledge (N = 154; 64.17%) (see Table 2). There was no significant association between USN knowledge and physiotherapist's gender (t=0.25; p=0.801), cadre (F=1.94; p=0.470), settlement setting of the facility (F=0.26; p=0.855), and physiotherapist's educational level (F = 1.94; p = 0.125). However, having a postgraduate certification (t = -3.780; p = 0.001), clinical practice setting (F=3.51; p=0.008), and working full time in neurorehabilitation (t = -2.158; p = 0.033) were significantly associated with therapist's knowledge of USN. There was a nonsignificant minimal positive correlation between duration of practice in a neuro-rehabilitation setting (r = 0.02; p = 0.854) and USN knowledge. Also, there was a nonsignificant minimal negative correlation between duration of practice as a physiotherapist (r = -0.02; p = 0.772) and USN knowledge. The age of physiotherapists showed no linear relationship with the therapist's knowledge of USN (r = -0.00; p = 0.992). Table 3 shows a summary of inferential statistics on the relationship between physiotherapists' knowledge score of USN and their sociodemographics. Furthermore, item-by-item analysis of the questions on knowledge of post-stroke USN showed that 226 (94.96%) physiotherapists agreed that "Constraint-induced movement therapy is a rehabilitation option for USN." In addition, Albert's test was identified as the standardized screening tool for USN (Table 4).

Table 1 Sociodemographic characteristics of responders (N=94)

Variable	Value
Age	
Median (IQR) in years	31 (28–36)
Gender, <i>n</i> (%)	
Male	65 (69.89)
Female	27 (29.03)
Preferred not to say	1 (1.08)
Settlement setting, n (%)	
Semi-rural	4 (4.26)
Semi-urban	19 (20.21)
Urban	71 (75.53)
Years of practice as a physiotherapist, median (IQR) in years	6 (4–10)
Educational level, n (%)	
Bachelors	47 (50)
Postgraduate diploma	2 (2.13)
Master's degree	36 (38.30)
Doctorate	9 (9.57)
Clinical practice setting, n (%)	
Hospital	58 (61.70)
Rehabilitation center	11 (11.70)
Out-patient department	14 (14.89)
Domiciliary/home health	9 (9.57)
Others (academics)	2 (2.13)
Postgraduate certification in neurological rehabilitatio	on, <i>n</i> (%)
Yes	33 (35.87)
No	59 (64.13)
Work full time in neuro-rehabilitation, <i>n</i> (%)	
Yes	51 (54.26)
No	43 (45.74)
Duration of practice in neuro-rehabilitation unit, median (IQR) in years	4 (3–7)
Cadre, <i>n</i> (%)	
Physiotherapist	43 (45.74)
Senior physiotherapist	18 (19.15)
Principal physiotherapist	12 (12.77)
Chief physiotherapist	4 (4.26)
Assistant director of physiotherapy	9 (9.57)
Director of physiotherapy	4 (4.26)
Others	4 (4.45)

IQR interquartile range

Physiotherapists' practice of post-stroke unilateral spatial neglect

One-hundred and seventy (71.4%) physiotherapists indicated that they provide treatment to stroke survivors who exhibit spatial neglect symptoms. On the assessment of patients with neglect, the majority of the respondents (n=77; 45.5%) indicated that on average, they identified 1–2 patients that exhibit USN symptoms every 3 months. Also, the majority of the respondents (n=51; 30%) of the physiotherapist indicated that the average duration before performing an evaluation to identify USN in stroke patients was 3 to 5 days after admission into rehabilitation. In addition, less than half of the physiotherapists (n=79; 46.75%) reported using a specific standardized tool in assessing patients for USN (Table 5). Among the therapists that indicated that they used specific assessment tools for screening USN in practice, the Albert test (n=39; 49.37%) was the most utilized assessment tool (Fig. 2).

When asked type of treatment used in practice, the majority of the physiotherapists indicated that constraintinduced movement therapy (86.47%) and transcranial stimulation (3.53%) were the most and least utilized intervention for patients with post-stroke USN respectively (Fig. 3). One-hundred and fifty-six physiotherapists indicated they referred their patients to other members of the health team. Neuropsychologist (91.03%) followed by occupational therapists (60.90%) were reported to receive the majority of referrals (Fig. 4).

Physiotherapists' perceived barriers and enablers to the treatment of post-stroke unilateral spatial neglect

The majority of the respondents indicated that "Lack of relevant equipment for Rehabilitation of USN at clinical practice" (73.72%), "Limited staff capacity" (62.82%), and "lack of hands-on pre-requisite skills needed for post-stroke unilateral spatial neglect rehabilitation" (57.0%) were the major barriers to post-stroke USN rehabilitation. Also, about half (49.36%) of the respondents reported that the therapists' belief that therapy for patients with USN made no difference was a barrier to USN rehabilitation (Fig. 5). When therapists were asked about enablers to USN rehabilitation, "Specialized training in USN management" was reported by the majority (83.56%) of physiotherapists as an enabler to post-stroke USN treatment; the "Presence of multidisciplinary stroke team in clinical practice" (83.56%) and "Availability of relevant equipment at clinical practice (84.25%)" were also found to be major enablers to the management of USN (Fig. 6).

Discussion

This study evaluated physiotherapists' knowledge, current practice, barriers, and enablers to post-stroke USN rehabilitation in Nigeria. To the best of our knowledge, this is the first nationally representative study to evaluate the physiotherapists' knowledge, current practice,

 Table 2
 Ranking of scores on physiotherapists' knowledge of post-stroke USN

Variable	Value
Overall knowledge about unilateral spatial neglect	
Mean (SD) %	14.23 (3.61)
Maximum knowledge score	22
Minimum knowledge score	4
Categories of USN knowledge score	
< 10: Poor knowledge <i>n (%)</i>	9 (9.57)
10–19: Moderate knowledge <i>n (%)</i>	78 (82.98)
20–25: Good knowledge <i>n (%)</i>	7 (7.45)

barriers, and enablers to post-stroke USN rehabilitation in Nigeria. Physiotherapists' understanding of poststroke USN is important for the holistic management of stroke patients. This study showed that a vast majority of physiotherapists surveyed demonstrated moderate knowledge, while fewer physiotherapists demonstrated good knowledge of post-stroke USN. This implies that physiotherapists in our clime had a decent knowledge of USN. This is in tandem with the study by Kalu and colleagues that reported a moderate level of knowledge about multiple medications as a risk factor for falls [40]. Although fewer therapists demonstrated good knowledge of the subject, it is however not daunting as previous studies reported that Nigerian physiotherapists demonstrated good knowledge of health promotion in Nigeria [41]. However, our finding is in contrast with previous studies that reported poor knowledge of physiotherapists on topical pharmacotherapy [42], leprosy [43], and the use of a stroke assessment scale [44]. This moderate knowledge of post-stroke USN demonstrated by the participants in our study could be attributed to the fact that physiotherapists based on the nature of their training are experts in stroke rehabilitation as succinctly identified by Bernhardt and colleagues that asserted that physiotherapists are active drivers in stroke rehabilitation [45]. The presence of a neurological physiotherapy team may also have played a pivotal role in the high preponderance of moderate knowledge in our study as our population is physiotherapists working with stroke patients, and it could be postulated these clinicians took advantage of the learning opportunity in the form of stroke-specific continuing education that the worksite presents. However, an item-by-item analysis of the knowledge questionnaire depicts that physiotherapists in Nigeria had poor knowledge of standardized outcome measures used in post-stroke USN. This finding agrees with previous studies [44, 46] which identified poor knowledge of the Page 6 of 15

stroke assessment scale among Nigerian physiotherapists. Although our study did not take into cognizance the reasons for this occurrence, Udoka and colleagues [44] reported the reason physiotherapists did not utilize standard outcome measures was that therapists were not taught the use of stroke assessment in their undergraduate training. However, the physiotherapy training curriculum in Nigeria has evolved over the years in practice and learning with curriculum changes to meet the current demands of professionalism in physiotherapy. Hence, we cannot categorically affirm that Udoka and colleagues' report 10 years ago are still valid as reasons for the nonutilization of standardized outcome measures in practice in our study. Other factors identified that hinder the use of standardized outcome measures include cost, practicality, clinical relevance and a lack of knowledge over which outcome measures to choose and their use, lack of resources, lack of time, availability, lack of management support, lack of training, and feasibility of measurement instruments [47, 48]. Furthermore, possession of a certification in neuro-rehabilitation, working full time in neurology, and therapist's practice setting were statistically associated with increased knowledge of post-stroke USN. This finding corroborates previous studies that showed that rehabilitation professionals who had higher qualifications had a higher knowledge of stroke-specific evidence-based practice (EBP) [18, 31]. This might not be unconnected to the content of advanced condition-specific training and critical reasoning received in advanced training. Similarly, workplace enablement such as working full time in a neuro-rehabilitation unit presents ample time and stroke-specific learning opportunities for the therapist to continually participate in patient care and also participate in continuing medical education that the worksite provides which may influence their knowledge of the subject. Why the clinician's duration of work in neuro-rehabilitation was not statistically associated with knowledge scores is an interesting query. It may be that the therapist is not fully stationed at the unit for a significant amount of time as most health facilities operate such that physiotherapists rotate between various units available in that facility. Interestingly, more than half of the physiotherapists in our study indicated that they do not work full time in neurorehabilitation units. This is not unusual as Nigerian physiotherapists working in tertiary facilities are posted to several sub-specialty units including orthopedics, neurology, pediatrics, and cardiopulmonary physiotherapy. This observation, however, underscores the importance of a clinical-based residency training program so that therapists will have focused and specific competencies in specific specialty areas.

Table 3 Relationship between physiotherapists' knowledge score of USN and demographics

Variable	Mean knowledge score	SD	Statistic	<i>p</i> -value
Age	14.23	3.61	0.21 ^a	0.04**
Gender				
Male	13.85	2.62	0.65 ^b	0.515
Female	14.40	4.01		
Settlement setting of facility				
Semi-rural	15.75	2.87	1.89 ^c	0.156
Semi-urban	12.89	2.20		
Urban	14.50	3.87		
Educational level				
Bachelors	13.06	3.44	4.10 ^c	0.009**
Postgraduate diploma	14.00	1.41		
Master's degree	15.19	3.76		
Doctorate	16.55	1.81		
Clinical practice setting				
Hospital	14.09	3.36	0.76 ^c	0.56
Rehabilitation center	14.36	4.34		
Out-patient department	13.93	4.70		
Domiciliary/home health	14.55	2.55		
Postgraduate certification in neurological rehabilitation				
Yes	15.84	3.62	- 3.228 ^b	0.002**
No	13.42	3.36		
Work full time in neuro-rehabilitation				
Yes	14.80	3.68	-1.681 ^b	0.096
No	13.55	3.45		
Duration of practice in neuro-rehabilitation unit	14.23	3.61	0.24 ^a	0.090
Years of practice as a physiotherapist	14.23	3.61	0.22 ^a	0.039**
Cadre				
Physiotherapist	13.46	3.15	1.66 ^c	0.141
Senior physiotherapist	13.94	5.01		
Principal physiotherapist	14.75	3.41		
Chief physiotherapist	16.00	1.41		
Assistant director of physiotherapy	15.78	3.38		
Director of physiotherapy	13.25	1.89		
Others (academics that are honorary consultants)	18.00	1.83		

** Statistical significance. @p-value \leq 0.05

^a Spearman rank correlation

^b Student *t*-test

^c ANOVA

Conversely, physiotherapists' gender, the settlement setting of the facility, and the cadre of physiotherapists were not statistically associated with knowledge. Although these characteristics are institutional factors and were not significantly associated with physiotherapists' knowledge score on post-stroke USN, some interesting findings were observed. Firstly, those physiotherapists working in urban and semi-urban settings had a better knowledge score than therapist working in other settings. Likewise, chief physiotherapists had better knowledge scores. Anecdotally, it might be that physiotherapists practicing in urban and semi-urban settings have more access to learning facilities and Internet resources at their disposal to engage in continuing education programs than their counterparts in the rural setting. Furthermore, it is not daunting that the chief physiotherapist cadre had the highest post-stroke USN knowledge. This could be attributed to institutional practices and administration Table 4 Item-by-item frequency distribution of responses of physiotherapists to questions on knowledge on unilateral spatial neglect

			Responses N (%)		
S/no	Statement	Agree	Disagree	Undecided	
1	Unilateral spatial neglect is the inability to orient or respond to stimuli appearing on the contralateral side of brain lesion	91 (96.81)	2 (2.13)	1 (1.06)	
2	Unilateral spatial neglect in stroke patients is more common in left hemispheric stroke than in right hemi- spheric stroke	36 (38.30)	37 (39.36)	21 (22.34)	
3	Unilateral spatial neglect in stroke is commonly associated with a lesion in the inferior parietal lobe	45 (47.87)	14 (14.89)	35 (37.23)	
4	Unilateral spatial neglect in stroke is commonly associated with cognitive dysfunction	55 (58.51)	23 (24.47)	16 (17.02)	
5	Brain tumors can result in unilateral spatial neglect symptoms	75 (79.79)	9 (9.57)	10 (10.64)	
6	Traumatic brain injury cannot result in unilateral spatial neglect symptoms	17 (18.09)	70 (74.47)	7 (7.45)	
7	Unilateral spatial neglect in stroke is more common in younger patients than in older individuals	5 (5.38)	62 (66.67)	26 (27.96)	
8	Most stroke patients with unilateral spatial neglect symptoms show recovery within the first week	15 (15.96)	49 (52.13)	30 (31.91)	
9	Unilateral spatial neglect in stroke is associated with a longer hospital stay	45 (47.87)	38 (40.43)	11 (11.70)	
10	Unilateral spatial neglect in stroke predicts poor rehabilitation outcome	60 (63.83)	21 (22.34)	13 (13.83)	
11	Albert's test is a standardized screening tool for unilateral spatial neglect	32 (34.04)	4 (4.26)	58 (61.70)	
12	The Crovitz-Zener scale can be used to screen for unilateral spatial neglect	35 (37.23)	7 (7.45)	52 (55.32)	
13	Spinal cord injury is a condition to consider for differential diagnosis of spatial neglect	36 (38.30)	47 (50.00)	11 (11.70)	
14	The best possible time for assessment of unilateral spatial neglect in stroke patients is at the chronic stage	16 (17.02)	66 (70.21)	12 (12.77)	
15	Unilateral spatial neglect symptoms can be treated using pharmacological agents	28 (29.79)	47 (50.00)	19 (20.21)	
16	The drug rivastigmine can be used in the management of unilateral spatial neglect symptoms	27 (28.72)	19 (20.21)	48 (51.06)	
17	Mirror therapy is a rehabilitation option for unilateral spatial neglect	91 (96.81)	1 (1.06)	2 (2.13)	
18	Eye patching is a rehabilitation option for unilateral spatial neglect	64 (68.09)	7 (7.45)	23 (24.47)	
19	Functional electrical stimulation and transcutaneous electrical stimulation are rehabilitation options for unilateral spatial neglect	61 (64.89)	16 (17.02)	17 (18.09)	
20	Constraint-induced movement therapy is a rehabilitation options for unilateral spatial neglect	91 (96.81)	3 (3.19	-	
21	Line crossing, letter cancellation, star cancellation, figure and shape copying, line bisection, and representa- tional drawing can be used as an assessment tool to establish the presence of unilateral spatial neglect	82 (87.23)	6 (6.38)	6 (6.38)	
22	Use of yoked prism is a treatment option for unilateral spatial neglect, and that its benefits extend to dress- ing, postural stability, walking, sit-to-stand transfers, and wheelchair driving	61 (65.59)	3 (3.23)	29 (31.18)	
23	Visual scanning exercise is not an effective technique in the treatment of unilateral spatial neglect	28 (29.79)	42 (44.68)	24 (25.53)	
24	Listening to music scale will not ameliorate unilateral spatial neglect symptoms	29 (31.18)	26 (27.96)	38 (40.86)	
25	Mental practice cannot improve unilateral spatial neglect symptoms	22 (23.66)	58 (62.37)	13 (13.98)	

in Nigeria. First, the chief physiotherapy cadre in many settings are heads of various units and are involved in day-to-day clinical operations. This is in sharp contrast to the assistant director cadre counterparts in most tertiary health facilities in Nigeria that are mostly in administrative and managerial duties. Secondly, they, in most instances, have more access and funding to CPDs in the form of workshops and in-service training which exposes them to current trends in treatment approaches. Thirdly, they must have worked longer in a unit (including the neurological unit) than most other lower cadres hence must have acquired more clinical skills and exposure as they ascend the ranks.

Our study also evaluated the current practices of physiotherapists in post-stroke USN treatment. Findings from our study revealed that the majority of our respondents provided treatment with USN symptoms, whereas less than half of clinicians indicated the use of some form of standardized assessment tool. A similarly low prevalence has been documented in Canada where only 13% of post-stroke survivors were assessed with a standardized USN assessment tool [49]. A divergent finding was also reported in a Canadian study by Menon-Nair and colleagues where only 27% of therapists reported using standard assessment tools for assessment of USN [31].

Odole and colleagues [46] in a previous study in Nigeria also reported the poor usage of standard account measures among Nigerian physiotherapists in practice. This observation might not be unconnected to training received as Okafor and colleagues reported that a low number of physiotherapists (28%) reported the use of outcome measure due to training received [44]. Interestingly, our study corroborates this finding, and
 Table 5
 Physiotherapist's practice in post-stroke unilateral spatial neglect management

Statement	Frequency	%
Do you provide treatment to stroke survivors who exhibit spatial neglect sympto	oms?	
Yes	82	87.2
No	12	12.8
Number of cases of stroke patients with unilateral spatial neglect do you identify	v every 3-month period	
1–2	41	50.6
>2-5	23	28.4
>5-10	10	12.3
>10-15	7	8.6
Duration before performing initial evaluation to identify unilateral spatial neglect	ct in stroke patients (days)	
1–2	24	29.6
>2-5	24	29.6
> 5-10	19	23.5
>10-15	7	8.6
> 15–20	2	2.5
>20-30	1	1.2
> 30	4	4.9
Do you re-evaluate a patient for unilateral spatial neglect after you have perform	ned an initial evaluation?	
Yes	74	92.5
No	6	7.5
How soon do you re-evaluate a patient for unilateral spatial neglect after you have	ve performed an initial evaluation (in days)?	
1–2	6	8.1%
>2-5	10	13.5%
>5-10	25	33.8
>10-15	15	20.3
> 15-20	7	9.5
>20-30	6	8.1
> 30	5	6.8
Specific screening tool in assessing of your patients for unilateral spatial neglect		
Yes	37	45.7
No	44	54.3
Do you refer patients with post-stroke to other members of the healthcare teams	?	
Yes	79	96.30
No	3	3.70

it was observed that physiotherapists demonstrated poor knowledge in identification of standard outcome measures used as shown in the item-by-item analysis of knowledge on post-stroke USN. More so, the lack of identification of post-stroke USN is serious for both the patient and society and raises concern that most patients return home to resume activities, such as community mobility or driving, without having been alerted to the potential dangers. Repeat assessment is also important, given that the rate of recovery from neglect is greatest within the first month after a stroke. Sadly, the initial identification of neglect was quite low in our study. A similar finding was reported by Menon-Nair and colleagues [49] though a prevalence (37.0%) of USN has been reported by Hamzat et al. in a Nigerian population [34]. Interestingly, re-evaluation practice among therapists was good and conforms to clinical practice guidelines for stroke which emphasized timely and multidisciplinary patient assessment using a formal protocol in documented form and carried out within 72 h of patient admission after stroke [50]. Albert's test and the behavioral inattention test were indicated as the most utilized USN assessment tools by physiotherapists. Similarly, majority of clinicians indicated using a USN intervention with the three most common being constraint-induced movement therapy (CIMT), mirror therapy, and limb



Fig. 2 Assessment tools utilized by physiotherapists in identifying post-stroke USN (N=79)



Fig. 3 Treatment utilized by physiotherapists in the treatment of post-stroke USN in practice (N = 170)



Fig. 4 Referral system for post-stroke unilateral spatial neglect (N = 156)

activation exercise. This finding is not surprising as a vast majority of respondents is knowledgeable on the therapeutic effects of these treatment options. However, Menon-Nair et al. [49] in their study reported perceptual training and Bells test in a Canadian study as the most utilized intervention constraint induced movement therapy as the least reported utilized intervention for USN. Similarly, Checketts and colleagues in a multidisciplinary, international survey reported that cognitive tests were used in USN assessment by 82% of psychologists, cancellation and drawing were most popular, and 80% used functional assessments (physiotherapists were most likely). A total of 20% (mainly physicians, from Italy) used neuroimaging/neuromodulation [51]. Though CIMT has been investigated in neglect treatment and a considerable evidence on its efficacy abound [10], an interesting finding is that the reported intervention for amelioration of post-stroke USN in this study is not in tandem with this trend in USN treatment. Umeonwuka and colleagues [52], in a scoping review, reported the combination of two or more approach and Prism adaptation therapy as the most investigated and promising rehabilitation intervention for post-stroke USN.

Lastly, we also explored barriers and facilitators physiotherapists encounter in the treatment of patients with post-stroke USN. In our study, the three most reported barriers to post-stroke USN treatment by Nigerian physiotherapists include the following: (i) lack of relevant equipment for rehabilitation of USN, (ii) limited staff capacity, and (iii) lack of hands-on prerequisite skills needed for USN management. This finding corroborates a study in Canada by Petzold et al. [16] that indicated a lack of basic skills specific to USN treatment as one of the key barriers to management of post-stroke unilateral neglect. Similarly, Baatiema et al. [53] identified limited staff numbers, inadequate staff development opportunities, and limited knowledge of stroke care interventions as barriers to evidence-based acute stroke care in Ghana. This is understandable as stroke generally need specialized skills. More so, Nigeria is a developing country, and physiotherapy practice in Nigeria, like in many developing nations, is fraught with some challenges such as unwholesome work settings, understaffing, and lack of appropriate equipment. Given that the identified barriers in our study are health system and hospital level-related factors, health systems strengthening through the provision of adequate and effective acute stroke care services are essential. To address the issue of limited staff numbers, an immediate short-term measure would be to consider task shifting approaches, as opined by Akinyemi and colleagues [54] which has shown to improve knowledge of health workers in acute stroke care, thus potentially translating into improved patient outcomes.



Fig. 5 Physiotherapist's perceived barriers to unilateral spatial neglect management (N = 170)

It is, however, not astonishing that majority of physiotherapists surveyed in our study identified specialized training in USN and practicing in environment with access to learning time about USN treatment as enablers to post-stroke USN treatment. This finding is consistent with previous studies [16]. The findings of the present study present practical implications. First, the identified barriers and facilitators to best practice for post-stroke USN assessment and treatment could be a reference point for future research on priorities for effective outcomes in stroke rehabilitation and for the planning of training programs specific for stroke care.

In conclusion, our study evaluated physiotherapists' knowledge, current practice, barriers, and enablers to post-stroke USN using a quantitative methodology. Findings show that majority of Nigerian physiotherapists who provide stroke rehabilitation services have good knowledge of post-stroke USN. This finding is crucial as it can inform policy for specialist entry level of practice in Nigeria as there is a growing paradigm shift from generalist to specialist care. Also, there is need for specialist training in the form of workshops, clinical residency training and seminars to further boost physiotherapist's capacity, and skills for better outcome in handling patients with post-stroke hemineglect. Barriers such as lack of relevant equipment for rehabilitation of USN, limited staff capacity, and lack of hands-on prerequisite skills needed for USN management should be addressed during hospital budget planning and design to improve outcomes. This study may serve as a reference point for a knowledge translation (KT) study for post-stroke USN rehabilitation in our milieu to bridge the gap between best practices and actual practices.

Limitation of study

A possible limitation of using an online test of knowledge includes clinicians looking to outside sources for answers. Also, the low response rate, sampling technique may affect the generalizability of the study result. Furthermore, it is a potential source of bias (selection



Fig. 6 Physiotherapist's perceived enablers to unilateral spatial neglect management (N = 170)

bias), since the questionnaire was delivered electronically; hence, physiotherapists in rural areas that have minimal access to Internet might have been excluded from the sampling process. To mitigate this bias, other means (such as non-electronic) were utilized to invite prospective participants to participate in the study. Also, several reminders were sent to prospective participants to encourage participants to partake in the study to increase the geographical and demographic spread of participation.

Lastly, the questionnaire used in this study did not explore the reasons answers pertaining to the choice of treatment for USN were selected. This may form a basis for future studies to explore reasons for the selection of treatment options for post-stroke USN.

Abbreviations

ACAPN	Association of Clinical and Academic Physiotherapists of Nigeria
ANOVA	Analysis of variance
CIMT	Constraint-induced movement therapy
CPD	Continuing professional development
EBP	Evidence-based practice
ΚT	Knowledge translation
MRTB	Medical Rehabilitation and Therapist Board
NFNR	Nigerian Federation of Neurorehabilitation
NSP	Nigerian Society of Physiotherapists
REDCap	Research Data Capture
USN	Unilateral spatial neglect
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Author contributions

C.I.U, R.R and V.N conceptualized and designed the study. R.R and V.N supervised the study including the data collection, analysis and manuscript drafting. C.I.U conducted the data collection, analysis and intial draft of the manuscript. All authors read the manuscripts and made inputs to the manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

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Ethics approval and consent to participate

Ethical clearance was obtained from the University of the Witwatersrand Committee for Research on Human Subjects (Approval Number M180155). Also, permission to conduct this study was obtained from the National Research Ethics Committee of Nigeria (Approval Number NHREC/01/01/2007– 30/07/2018) and the Medical Rehabilitation and Therapist Board of Nigeria.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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