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Awareness and use of Gross Motor Function Classification System (GMFCS) by health professionals in a developing country

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Abstract: *Introduction* The degree of disability in children with Cerebral Palsy (CP) can be evaluated with the Gross Motor Function Classification System (GMFCS), a valid tool which was designed for such purposes. However, there appears to be paucity of data on the awareness and use of the GMFCS particularly in the Sub-Saharan continent where the condition is still prevalent. Thus, this study aims to describe awareness, use, merits and demerits of the GMFCS system as perceived by health professionals who take care of children with CP.

Methods: This was a cross sectional study of health professionals from three Nigerian teaching hospitals. Information obtained via structured questionnaire were demographic data, years of qualification, years of experience of working with children with CP, awareness, use, merits and demerits of the GMFCS. Factors associated with use of the GMFCS were also evaluated with the Chi-square analysis.

Results: 78 health professionals

participated in the study and majority (58.9%) were doctors. 55 (70.5%) of the study participants were aware of the GMFCS but only 33(42.3%) were using it. The nurses were neither aware of the system nor using it. A higher proportion of therapists (65.4%) were familiar with the system compared to the doctors (54.3%). The location of practice was significantly associated with the use of the GMFCS ($p=0.013$). More doctors noted the merits and demerits of the system compared to the therapists.

Conclusion: Though health professionals were aware of the GMFCS only a small proportion was using this vital tool in the clinical setting. Thus, there is the need to create more awareness on GMFCS and its clinical utility, and the training of nurses should be of paramount importance in the developing country.

Key words: Awareness, cerebral palsy, gross motor function classification system, developing country

Introduction

Cerebral Palsy (CP), a major cause of disability in childhood is associated with significant morbidity and mortality and is of immense clinical and public health importance in the developing world^{1,2}. It is a disorder of posture and movement that results in impairment of function with the affected child failing to attain the level of function that is considered normal for his/her age. The motor disability in CP has been categorized as spastic diplegia (involvement of the lower limbs), spastic hemiplegia (weakness of the upper limb and the ipsilateral lower limb, usually, with a more severe involvement of the upper limbs) double Hemiplegia and spastic quadriplegia (weakness of both upper and lower limbs)^{2,3}. The disease has important implications for obstetric and paediatric services and imposes severe stresses and

strains on the carers of children who are afflicted^{4,5}.

In order to determine the degree of disability which is closely related to the gross motor function in children with cerebral palsy, different evaluation systems have been developed for both clinical utility and epidemiological purposes. One of such systems is the Gross Motor Function Classification System (GMFCS)^{6,7}. This system was developed as a response to the need to have a standardised system for describing and classifying the severity of movement disability among children with cerebral palsy⁷. It was validated by Palisano et al⁶ for clinical use and this classification has been found to be reliable and stable over time^{6-9,10}. Some workers have noted that the classification done at two years of age was able to predict walking by 12 years.¹¹

The GMFCS objectively categorizes the child's current

gross motor function with particular emphasis on sitting and walking. There are five levels in the system ranging from level 1 where the child has the most independent functional skills to level 5 where there are severe limitations of self-mobility even with the use of assistive technology.⁷ The GMFCS has been found to be very useful by health professionals and the caregivers in describing the gross motor function of children with CP and further complements other classification systems used to describe the status of the children with CP especially in the developed countries.⁸ Other workers have also observed that appropriate functional classification of this children aids diagnosis, treatment and prognostication.^{7,9,12-17} Thus, in a developing country like Nigeria where there is still a huge burden of CP as it constitutes 40-55% of paediatric neurologic consultations in different centres in the country it is important that affected children are properly evaluated and classified to facilitate management and possibly predict prognosis.^{18,19} Furthermore, in Nigeria, there is a paucity of data on the use of the GMFCS to evaluate the children with CP. This study aims to describe awareness and use of the GMFCS and the merits and demerits of the system as perceived by health professionals who take care of children with CP.

Methods

This was a cross-sectional study carried out in Nigeria between August 2011 and July 2012 at 3 different centres, namely the Paediatric Neurology Clinics at the Lagos University Teaching hospital, University College Hospital Ibadan, and the Lagos State University Teaching Hospital, Lagos. These 3 referral centres in the South western Nigeria were selected by simple random sampling technique and are centres where children with CP are seen on a regular basis. The study population comprised of doctors (these included paediatricians, paediatric residents and orthopaedic surgeons), therapists (namely Physiotherapists and occupational therapists), and nurses who are involved in the management of children with CP.

Data was collected through a self administered structured questionnaire which was given to the health professionals by hand. The questionnaire was pre-tested among resident doctors in the LUTH prior to the commencement of the study. Information collected in the questionnaire included demographic characteristics (name, sex, occupation), years of qualification, years of experience of working with children with CP, classification system and awareness and experience with the use of the gross motor function classification system.

Ethical considerations

Ethical approval was received from the research and ethical committees of the different institutions. Informed consent was also obtained from the study participants before enrolment in to the study.

Definition of terms

“The GMFCS is a standardized system to classify gross motor function of children with CP aged 12 months to 12 years based on observation of a child's self-initiated movement and need for assistive technology and/or wheeled mobility. Classification is made based on a child's usual performance – not best performance – at home, school, and in the community. There are five levels from level I, in which a child is able to walk and run, but has some difficulty with more advanced skills to level V, in which a child has very limited voluntary movement ability. In the original system, there are four age bands: under 2 years, 2 to < 4 years, 4 to < 6 years, and 6 to < 12 years. More recently there is the expanded version of the system in which the age band 12-18 years has been introduced”.

Information on the merits/advantages and demerits/disadvantages was also obtained. The known advantages of the GMFCS such as being evidence based, predicting prognosis, guiding intervention and others were highlighted and the study participants were to choose Yes or no responses where applicable. Options for the demerits were also provided.

The health professionals were categorized according to the 3 main groups: Doctors, Therapists and Nurses. The years of qualification was also divided into 3 groups namely: < 10 years, 10-20 years and > 20 years. The years of experience working with children with CP were also divided into 3 groups : < 5 years, 5-10 years and > 10 years.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) for Windows, version 17.0). Data summarization was done using frequency and proportions. The association between categorical variables was tested using the Chi-square test. Level of significance was set at $P < 0.05$.

Results

General characteristics of the study participants

The general characteristics of the study participants are shown in Table 1. A total of 78 health professionals participated in the study, 46(58.9%) were doctors, 26 (33.3%) were therapists and 6(7.8%) were nurses. The doctors comprised 6 paediatricians, 36 paediatric residents and 4 orthopaedic surgeons. Therapists were 24 physiotherapists and 2 occupational therapists. Many of the doctors (67.4%) in the study had basic qualification below 10years these were mainly resident doctors in paediatrics. The doctors with basic qualification above 20 years were paediatricians. On the other hand majority of the therapists (50%) had basic qualification between 10-20 years.

The years of working with CP patients was significantly different amongst the professionals ($p = 0.009$) and 53.8% of the therapists had more than 5 years experience working with children with CP. 10(38.5%) of the therapists compared to 7(19.6%) of the doctors were

also seeing more than 20 patients with CP on a monthly basis.

Table 1: General characteristics of the study participants

Parameters	Doctors	Professions Physio- therapists	Nurses	Total
<i>Gender</i>				
Male	22	20	0	42
Female	24	6	6	36
	N (%)	N (%)	N (%)	N (%)
	46 (100)	26 (100)	6(100)	78(100)
<i>Years of qualification</i>				
<10 years	31(67.4)	11 (42.30)	2 (33)	44(56.4)
10-20 years	12(26.1)	13(50)	2(33)	27(34.6)
>20 years	3 (8.7)	2 (7.7)	2(33)	7(9)
<i>Years of experience of working with children with CP</i>				
<5 years	27(58.7)	12 (46.2)	4(66.7)	43(55.1)
5-10 years	12(26.1)	10 (38.5)	2(33.3)	24(30.8)
>10 years	7 (15.2)	4(15.3)	----	11(14.1)
<i>Number of children seen in one month</i>				
1-10	25(54.3)	7(26.9)	6(100)	38(48.7)
11-20	12(26.1)	9(34.6)	----	21(26.9)
>20	7(19.6)	10(38.5)	-----	17(24.4)

CP - Cerebral Palsy

Awareness and use of the GMFCS

Awareness and use of the GMFCS is shown in Table 2. Fifty five (70.5%) of the study participants were aware of the GMFCS. Most of the therapists (80.8%) were aware of the GMFCS but only 14(53.8%) used the scale in the routine care of their patients. Similarly, the majority of the doctors (73.9) were also aware but only about half (39%) of them employed its use.

Knowledge of the content of the GMFCS was significantly different amongst the professionals. ($p=0.015$), A higher proportion of the therapists were also more familiar with the content of the GMFCS compared to the doctors.

Factors associated with the use of GMFCS

The factors associated with the use of GMFCS are shown in Table 3. The use of the GMFCS was significantly associated with location of practice especially for the therapists. ($p=0.013$). All the therapists in UCH were using the GMFCS while only 50% and 23.1% of the therapists in LASUTH and LUTH respectively were using the system. Similarly, majority of the doctors (71.4%) in UCH were using the system compared to only 35.1% in LUTH. The years of experience of working with children with CP was not significantly associated with the use of the GMFCS.

Merits and demerits of the GMFCS

The merits and the demerits of the GMFCS were evaluated in this study. A significant proportion of doctors (57.7%) and therapists (42.3%) thought the GMFCS was evidenced based. However, more doctors were observed to report other advantages compared to the therapists.

In terms of demerits 88% of the therapists believed the GMFCS was more time consuming while only 11.1% of the doctors reported this as a disadvantage. More doctors however thought it was cumbersome and complex.

Table 2: Awareness, use and familiarity with the GMFCS

Awareness and Use*	Profes- sions	Doctors	Therapist	Nurses	Total	X ²	P value
		N (%)	N	N			
		46 (100)	26 (100)	6 (100)			
<i>Awareness</i>							
Yes		34(73.9)	21(80.8)	0	55(70.6)	15.92	0.000
No		12(26.1)	5 (19.2)	6(100)	23(29.4)		
<i>Use of GMFCS</i>							
Yes		18(39.1)	15(57.7)	0	33(42.3)	5.76	0.055
No		24 (52.2)	11(42.3)	6(100)	41(52.6)		
<i>Familiarity/ knowledge of content of GMFCS</i>							
Yes		25(54.3)	17(65.45)	0	42(53.8)	8.39	0.015
No		21(45.7)	9(34.6)	6(100)	36(46.2)		

GMFCS- Gross Motor Function Classification System, $P<0.05$ is considered significant

Table 3: Factors associated with the use of GMFCS

Factors	Use N (%)	Don't Use N (%)	Chisquare N (%)	P value
<i>Location of Practice</i>				
<i>Doctors</i>				
UCH	5(71.4)	2(28.2)	4.599	0.100
LUTH	13(35.1)	24(64.9)		
LASUTH	0	2(100)		
<i>Therapists</i>				
UCH	5(100)	0	8.678	0.013
LUTH	3(23.1)	10(76.9)		
LASUTH	7(50)	7(50)		
<i>Years of experience</i>				
<i>Doctors</i>				
<5 years	13(48.1)	14(51.9)	6.724	0.175
5-10 years	1(10.0)	9(90.0)		
>10 years	4 (57.1)	3(42.9)		
<i>Therapists</i>				
<5 years	8(47.1)	9(52.9)	0.804	0.849
5-10 years	2(33.3)	4(66.7)		
>10 years	2(50.0)	2(50.0)		

UCH- University College Hospital Ibadan, LUTH- Lagos University Teaching Hospital, LASUTH- Lagos State University Teaching Hospital, $P<0.05$ is significant

Table 4: Merits and Demerits of the GMFCS as perceived by the health professionals

Merits	Professionals		Total N(%)	*p value
	Doctors N(%)	Physio- therapist N(%)		
Evidence based	46 15 (57.7)	26 14(42.3)	72 29 (100)	0.395
Easy to remember	11(61.11)	7(38.89)	18	0.728
Internationally recognized	19(73.1)	7(26.9)	26	0.820
Convenient	14(63.6)	8(36.4)	22	0.975
Predicts prognosis	17(94.4)	1(5.6)	18	0.50
Guides Intervention	21(67.7)	10(32.3)	31	0.619
<i>Demerits</i>				
Cumbersome	12(80)	3(20)	15	0.677
Complex	10(83.3)	2(16.7)	12	0.385
Time consuming	1(11.1)	8(88.9)	9	0.847

*P value of chi-square statistic, GMFCS- Gross Motor Function Classification System, P<0.05 is significant.

Discussion

The GMFCS was developed in response to the need to have a standardized system to measure the severity of movement disability in children with cerebral palsy (CP). It has been established as a valid system for assessing the functional status of the cerebral palsied child and its impact and utility has been described in literature especially for caucasian children with CP^{15,20-22}. In this study, the health professionals who participated in the study were at different levels of qualification and years of experience of working with children with CP, the nurses had the lowest experience with working with children with CP. 73.9% of the doctors and 80.8% of the therapists respectively were aware of the GMFCS. However, only 57.7% of the therapists and 39.1% of the doctors were using it respectively. Thus, it appears that there is a gap or bridge between the knowledge of this tool of assessment and its use in clinical practice or office setting in a developing country like Nigeria.

In a review by Morris et al¹⁵ on the impact and utility of the GMFCS, it was observed that the GMFCS has been used in observational research and experimental research by various workers. It was also noted that the uptake of the system by researchers had been rapid as several workers found it useful and this justified its extensive use by various researchers in the developed countries.

However, in Nigeria, there are only few studies in which the GMFCS have been used to evaluate the children with CP^{2,23,24}. In a study conducted by therapists in Lagos, Tella et al²³ while evaluating the health related quality of life of 54 children with CP at Lagos used the GMFCS to evaluate the severity of motor disability in these patients. The severity of disability was observed to have a negative impact on the health related quality of life of the children. Hamzat et al²⁴, another group of physiotherapists in Ibadan, evaluated the gross motor

capability of a group of CP patients with the GMFCS and compared it to the gross motor performance determined by the parents using the and Gross Motor Function Classification System Family Questionnaire (GMFCSFQ). There was a strong correlation between the GMFCS scores and the GMFCSFQ scores. The study outcome suggested that both the caregivers and the care providers of children with hemiplegic and quadriplegic CP would turn in similar judgment while assessing motor function in this group of patients. In another study, Lagunju et al² used the GMFCS to determine the severity of functional impairment in CP patients and association with neurocognitive deficits. Forty four (14.5%) of the children were classified as class I, 32 (10.6%) class II, 24(7.9%) – class III, 48(15.8%) –class IV and 155(51.2%) –class V. The GMFCS provided an objective means of assessing the severity of disability and this showed a significant correlation with the presence of associated neurocognitive deficits and the overall burden of care of the child with CP.

In this present study, the nurses were neither aware of the system nor using it, the reason for this finding is not clear but plausible reasons may be that clinical evaluation of children with disability especially with the use of GMFCS may not be part of the schedule of duties of the nurses. In a developing country like Nigeria, there is poor access to health care facilities and about 60% of the population including children with CP would seek medical help from a nearby nurse before reporting to the hospital. Thus it might be of immense benefit if nurses were trained to evaluate children with CP with the GMFCS and to identify other deficits especially at the community level. These trained nurses can assess such children and refer them to the appropriate centre for comprehensive therapy.

Thirty two (41%) of the 78 health professionals who participated in this study used the GMFCS and 18 of these were doctors and 14 were therapists. It is not quite clear what factors influenced the use of the GMFCS by the professionals but knowledge of the content of the system may play a role. In addition, it was observed that the location of practice of the health professionals was significantly associated with the use of the system especially for the therapists. This implies that for any classification system to be utilized by a professional adequate knowledge of such a system and the centre where the professional practices may influence the use of such a system. It appears that in centres where there is a standardized protocol of evaluating of children with CP the use of the GMFCS plays a significant role². However, reports on the use of standardized clinical tools of assessment indicate a possible gap between the development of any tool of assessment and its use in the clinical setting as observed in this study. Thus, other propositions which may enable the use of such tools have been related to the known advantages or merits or demerits of the tool²⁵.

In this present study, majority (67.7%) of the doctors believed that the GMFCS could guide intervention while

only 32.3% of the therapists acknowledged this as an advantage of the system. Other workers have also observed that the GMFCS may also guide intervention. Dumas et al²⁶ reported that functional ability, defined broadly by classifying hypothetical children as 'more mobile' (GMFCS levels I to IV) and 'less mobile' (level V), influenced therapists' intervention choices. In a study on the effectiveness of horseback riding on the functional ability of CP Sterba²⁷ and workers also highlighted variation in treatment schedule between children categorized as GMFCS levels I, II, or III compared to levels IV and V. Even in terms of response to therapy some workers have observed a better response in younger children who were in GMFCS levels I- IV, compared to level V^{25, 28}. Other merits noted by the health professionals in this study such as prediction of prognosis has also been noted by other workers. However it was quite striking that only one of the therapists compared to 17 doctors thought that GMFCS was able to predict prognosis. The reason for this is not quite clear. Other merits observed in this present study were seen more by the doctors than the therapists. The demerits/disadvantages of the system mainly being cumbersome and complex were also observed more by the doctors than the therapists. Nevertheless, the observed advantages in this study still support the need to train nurses who are likely to be the first contact of children with CP in the community in evaluating such children in terms of functionality. However, in view of the observed disadvantages the more experienced nurses and those

with high academic qualification are likely to be the best target for training purposes. This group of nurses can then go on to even train other community health workers in issues pertaining to CP.

Limitation

The limitation of this study may be the small number of the health professionals it would have been more desirable to document the perspective of more health professionals from other centres but this was not possible for logistic reasons.

Conclusion

In conclusion, there appears to be a gap in the awareness and use of this valid tool in the assessment of children with CP. Knowledge of the content of the system and location of practice may influence the use of the GMFCS and thus standardized protocol for evaluating these children incorporating the GMFCS should be available in the centres where these children are being evaluated. There is a need to train nurses in the use of GMFCS as they play a key role in the management of such children. Known merits and demerits as observed by previous workers were also noted in the study. Further large multicentre studies are advocated.

References

1. J. Couper. Prevalence of childhood disability in rural KwaZuluNatal. *S Afr Med J.* 2002; 92: 549-552.
2. Lagunju I A, Okereke J, Adebayo A, Ani Olorunda T. Neurocognitive and sensory impairments in cerebral palsy. *J Paed Neurol.* 2010;8:385-390
3. Lagunju IA, Adedokun BO. A comparison of quadriplegic and hemiplegic CP. *J Paed Neurol.* 2008; 6: 25-30
4. Hutton JL, Pharoah POD. Life expectancy in cerebral palsy. *Arch Dis Child.* 2006; 91(3): 254-258.
5. Varqus-Adams JN, Martin Lk. Domains of importance for parents, medical professionals, youth with cerebral palsy considering treatment outcomes. *Child Care Health Dev.* 2011;37(2): 276-81
6. Palisano R, Rosenbaum P, Walter S, Russell D, Wood E, Galupp BE. Development and reliability of a system to classify gross motor function in children with cerebral palsy. *Dev Med Child Neurol.* 1997; 39:214-2232.
7. Morris C, Bartlett D. Gross Motor Function Classification System: impact and utility. *Dev Med Child Neurol* 2004; 46: 60-65.
8. Palisano RJ, Cameron D, Rosenbaum PL, Walter SD, Russell D. Stability of the gross motor function classification system. *Dev Med Child Neurol.* 2006; 48 (6):424-8.
9. Palisano RJ, Hanna SE, Rosenbaum PL, Russell DJ, Walter SD, Wood EP, et al. Validation of a model of gross motor function for children with cerebral palsy. *Phys Ther* 2000; 80: 974-985.
10. Russell DJ, Avery LM, Rosenbaum PL, Raina PS, Walter SD, Palisano RJ. Improved scaling of the gross motor function measure for children with cerebral palsy: evidence of reliability and validity. *Phys Ther.* 2000;80 (9):873-85
11. Wood E, Rosenbaum P. The Gross Motor Function Classification System for Cerebral Palsy: a study of reliability and stability over time. *Dev Med Child Neurol* 2000, 42: 292-296.
12. Ashwal S, Russman BS, Blasco PA et al., Practice parameter: diagnostic assessment of the child with cerebral palsy: report of the Quality Standards Subcommittee of the American Academy of Neurology and the Practice Committee of the Child Neurology Society, *Neurology.* 2004; 62: 851-863.
13. Ostensjo S, Carlberg EB, Vollestad NK. Motor impairments in young children with cerebral palsy: relationship to gross motor function and everyday activities. *Dev Med Child Neurol.* 2004;46(9):580-9
14. McLaughlin J, Bjornson K, Temkin N, Steinbok P, Wright V, Reiner A, Roberts T, Drake J, O'Donnell M, Rosenbaum P, Barber J, Ferrel A. Selective Dorsal Rhizotomy: meta-analysis of three randomized controlled trials. *Dev Med Child Neurol.* 2002;44:17-25.
15. Morris C. A review of the efficacy of lower limb orthoses used for cerebral palsy. *Dev Med Child Neurol.* 2002; 44: 205-211.
16. K. Himmelmann, E. Beckung, G. Hagberg and P. Uvebrant, Gross and fine motor function and accompanying impairments in cerebral palsy. *Dev Med Child Neurol.* 2006; 48: 417-423.

17. Kim HS, Steinbok P, Wickenheiser D. Predictors of poor outcome after selective dorsal rhizotomy in treatment of spastic cerebral palsy. *Childs Nerv Syst.* 2006; 22(1):60-6.
18. Wammanda RD, Onalo R, Adama SJ. Pattern of neurological disorders presenting at a pediatric neurology clinic in Nigeria. *Ann Afr Med.* 2007; 6:73-75.
19. Lagunju IA, Okafor OO. Analysis of disorders seen at the Pediatric Neurology Clinic, University College Hospital, Ibadan, Nigeria, *West Afr J Med.* 2009;28; 38-42.
20. Bottos M, Feliciangeli A, Sciuto L, Gericke C, Vianello A. Functional status of adults with cerebral palsy and implications for treatment of children. *Dev Med Child Neurol.* 2001;43:516-528
21. Sala DA, Grant AD. Prognosis for ambulation in cerebral palsy. *Dev Med Child Neurol.* 1995;37:1020-1026
22. Rosenbaum PL, Walter SD, Hanna SE, Palisano RJ, Russell DJ, Raina P, Wood E, Bartlett DJ, Galuppi B. Prognosis for gross motor function in cerebral palsy: creation of motor development curves. *J Am Med Assoc* 2002; 288: 1357-1363. Top of Form Bottom of Form
23. Tella B, Gbiri, C, Osho O, Ogunrinu A. Health-Related Quality of Life of Nigerian Children with Cerebral Palsy. *Disability, CBR & Inclusive Development*, 22, No.1, 2011; doi 10.5463/DCID.v22i2.24
24. Hamzat TK, Fatudimu MB, Caregivers or Care providers: who should assess motor function in cerebral palsy? *J. Paed Neurol.* 2008; 6(4): 345-350
25. Linder M, Schindler G, Michaelis U, Stein S, Kirschner J, Mall V, Berweck S, Kointhenberg R, Heinen F. Medium-term functional benefits in children with cerebral palsy treated with botulinum toxin type A: 1-year follow-up using the gross motor function measure. *Eur J Neurol.* 2001; 8(5): 120-126.
26. Dumas HM, O'Neil ME, Fragala MA. Expert consensus on physical therapist intervention after botulinum toxin A injection for children with cerebral palsy. *Pediatr Phys Ther* 2001; 13: 122-132.
27. Sterba JA, Rogers BT, France AP, Vokes DA. Horseback riding in children with cerebral palsy: effect on gross motor function. *Dev Med Child Neurol.* 2002; 44: 301-308.
28. Trahan J, Marcoux S. Factors associated with the inability of children with cerebral palsy to walk at six years: a retrospective study. *Dev Med Child Neurol.* 1994; 36:787-795