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Measures of Function in Physical Therapy Assessment of Children with Cerebral Palsy: A Clinical Audit

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Abstract

Introduction. The assessment of outcomes in children with cerebral palsy (CP) is important for monitoring their progress, evaluating interventions, and guiding health policies. This study aimed to (1) identify the most common outcome measures used in the clinics to assess function in children with CP, and (2) determine whether the outcome measures used in the clinics meet the current standards of assessment for the purpose of improving patient care decisions, research, and quality assurance.

Methods. A retrospective record audit study design was used to determine if the current practice in the clinics on the assessment of function in children with CP meets the current standards of assessment.

Results. 96 charts with initial evaluation were reviewed from 5 pediatric institutions within Metro Manila that agreed to participate in this study. 18 out of these 96 charts (18.7%) met the current standards of assessment using gross motor function measure (GMFM), whereas 78 out of these 96 charts (81.3) used a descriptive type of assessment such as gait analysis (GA) [20.9%], activities of daily living (ADL) analysis [79.1%], functional muscle testing (FMT) [44.2%], gross motor skills assessment [37.2%], advanced motor skills assessment [23.3%], balance assessment [4.7%], developmental milestone assessment [2.3%], and self-adaptive measure [2.3%].

Discussion. The findings showed that most clinics prefer to use a descriptive type to assess function in children with CP. Furthermore, it was revealed that the pediatric institutions that agreed to participate in this study did not meet the current standards of assessment.

***Keywords*:** clinical audit, outcome measure, physical therapy assessment, function, cerebral palsy

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Introduction

Cerebral palsy (CP) stands as a predominant concern in child neurological disorders, impacting thousands of children globally. It is defined as "*a group of permanent disorders of the development of movement and posture, causing activity limitation, that is attributed to non-progressive disturbances which occurred in the developing fetal or infant brain*" (Rosenbaum & Steward, 2004). Furthermore, this condition has been known as the most prevalent disability among children. In a clinical review of CP by Patel et al. (2020), the incidence of CP is 2 to 2.15 per 1,000 live births in the general population.

The fundamental challenge for CP is gross motor dysfunction, as emphasized in a study by Labaf et al. (2015). The severity of limitations in gross motor function (GMF) among children with CP demonstrates significant variability (Hutton et al., 1994; Bulter and Arrah, 2001). However, it is important to recognize that the underlying cause for the motor problems associated with CP stems from dysfunction within the central nervous system. With such dysfunction, it would not only disrupt normal postural control against gravity but may also hinder typical motor development (Bulter and Arrah, 2001; Ketelaar et al., 2001; Mayston, 2001).

In a study by Boyce et al. (1991), gross motor behavior consists of two primary components: function and performance. Gross motor function refers to the ability to carry out specific motor activities, such as being able to sit independently for a duration of 10 seconds. On the other hand, gross motor performance relates to the quality with which these activities are executed, such as postural alignment and stability while in a seated position. In CP, the varied challenges that present to a child's daily functioning and long-term health outcomes have made it an area of extensive research, with diverse therapeutic approaches. Measuring the functional abilities of children with CP is crucial for understanding their individual needs, and in providing appropriate and justifiable interventions.

Physical therapists prioritize the utilization of evidence-based practices in their interventions. Most of these interventions or approaches are directed at the 'body functions and structures' domain of the International Classification of Functioning, Disability and Health (World Health Organization, 2001), with the goal of ultimately improving a child's activities and participation levels. However, it remains uncertain whether improvements at the impairment level can actually translate into functional benefits (Martin et al., 2010). Although there may be some systematic reviews already published, which have examined the interventions used in children with CP, there is still a gap to determine the overall effectiveness and efficacy of these interventions due to limited availability of high-quality research (Steultjens et al., 2004). Furthermore, the heterogeneity of CP as a health condition adds to the complexity of evaluating intervention outcomes. Outcome measure tools (OMTs) are then used to establish new evidence and to validate the efficacy of commonly used interventions. By incorporating OMTs into clinical practice, healthcare professionals can ensure that treatment approaches are guided by objective measurements of patient outcomes while fostering continuous improvement (Rozkalne and Bertule, 2014).

The definition provided by Rosenbaum et al. (2007) highlights a change in perspective regarding cerebral palsy, moving away from solely focusing on impairments and adopting the biopsychosocial model of health advocated by ICF. This shift in focus has led to the development of assessments that center around measuring function or activity rather than impairment. In a systematic review conducted by Harvey et al. (2008) which critically appraised the psychometric properties and clinical utility of OMTs used for children with CP to assess activity limitation, the review only included eight different OMTs that met their necessary criteria. These OMTs were specifically identified as the Child Health Questionnaire (CHQ), Functional Assessment Questionnaire (FAQ), Functional Mobility Scale (FMS), Pediatric Evaluation of Disability Inventory (PEDI), Pediatric Outcomes Data Collection Instrument (PODCI), (Functional Independence Measure for Children (WeeFIM), Gross Motor Function Measure (GMFM), and Activities Scale for Kids (ASK). The responsiveness to change validity of FAQ, CHQ, FMS, and PODCI was found to be inconclusive and requires further investigation. Meanwhile, WeeFIM and PEDI share similar domains in measuring functionality but differ in terms of data set requirements since WeeFIM includes minimum data sets making it more time-efficient when compared with PEDI which entails detailed information gathering processes. ASK and GMFM demonstrated the most robust psychometric properties among all considered scales.

Apart from OMT use, health professionals also use clinical practice guidelines (CPGs). The implementation of CPGs has the potential to address issues related to practice variation, promote effective translation of research into clinical practice, and enhance healthcare quality and safety. However, a notable absence of such CPGs exists in the context of the Philippines where there is a need for guidance in service delivery for this specific population. To address this gap effectively, initiating a clinical audit would be beneficial as it can optimize outcomes for service users by improving professional practice standards and enhancing the overall quality of services delivered. To accomplish this goal successfully, standardizing OMTs utilized within service delivery becomes imperative. With all these in mind, the objectives of this study were the following: (1) to identify the most common outcome measures used in the clinics to assess function in children with CP, and (2) to determine whether the outcome measures used in the clinics meet the current standards of assessment.

Methods

Ethical Consideration

This research study was ethically reviewed and approved by an institutional ethics review committee, with protocol number not included in this manuscript to ensure the anonymity of the author. In addition, this study upheld and complied with the Good Research Clinical Practice Guidelines of the Philippines Health Research Ethics Board and Data Privacy Act of 2012 (RA 10173) to ensure the privacy and confidentiality of all gathered data. Informed consent from the management was sought from the pediatric institutions who agreed to participate in this study.

Study Design

A retrospective study of clinical audit was used in this study. As this study requires chart review only, there was no recruitment of human subjects since data were redacted from charts. Pediatric centers within Metro Manila with PT services and an established database for children with CP were identified as study sites. Based on the directory of clinics used by pediatricians for PT referral, most pediatric institutions are in the following cities of Metro Manila: Makati, Mandaluyong, Pasig, Quezon, and Manila (Philippine Pediatric Society, 2017).

Criteria for Chart Review Selection

Selecting charts to be reviewed was based on a study from Debuse & Brace (2011) and Harvey et al. (2008). Inclusion criteria were as follows: 1) Charts from 2014 to 2017; 2) Medical diagnosis of cerebral palsy, or developmental disabilities and neurological conditions that include cerebral palsy; 3) Initial evaluation of children with CP aged 0 to 18 y/o; and 4) Outcome measure tools that measure activity or function, with emphasis on mobility and gross motor function. Meanwhile, exclusion criteria included: 1) Physical therapy notes of children with CP other than initial evaluation; 2) Tools individualized for each child using semi-structured interviews; 3) Tools not developed for children with CP; 4) Tools developed primarily to assess developmental status; and 5) Metrically measured tests.

Data Gathering Procedures

This research is underpinned by a step-by-step approach categorized into 2 phases. Phase 1 is on data abstraction tool development, whereas phase 2 is on the clinical audit.

Phase 1: Data Abstraction Tool Development. Figure 1 summarizes the steps done for Phase 1. To obtain information from the medical records, a data abstraction tool was used. Microsoft Excel was used for data input, quality control, and management of data for statistical analysis and reporting. Inclusion and exclusion criteria were used to make an abstract of 3 charts chosen by convenience that were representative of the charts to be encountered in the actual research. A preliminary version of the data abstraction tool was then made for a pre-pilot phase, where basic observations via inter-rater agreement of the experts for improvement of the tool. To ensure anonymity and patient confidentiality, chart codes were represented by a unique alphanumeric variable of 8 characters via random code generator accessed online. Categorical variables from the data abstraction tool were as follows: initial evaluation, highest function, medical diagnosis of CP, type of cerebral palsy, age, and OMT for function.

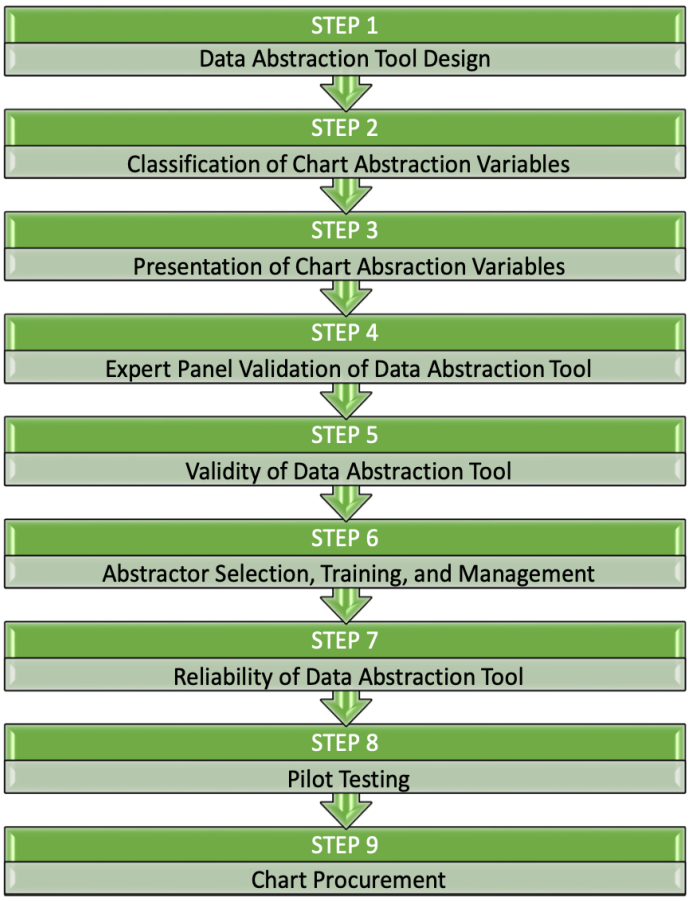

Figure 1. Phase 1: Data Abstraction Tool Development

Chart review variables were then grouped according to their source in the chart as to assessment, medical evaluation, demographics, and OMT for ease of analysis and interpretation. Data abstracted were then validated by an expert panel. Three experts who are licensed physical therapists with more than 2 years of clinical experience, with previous or current experience in a pediatric setting as a PT, and with several seminars attended in line with pediatric rehabilitation, and/or of children with CP were invited to be part of the panel. Content validity was done using a 4-point Likert scale. Also, each item had a free-text column for comments. Interrater reliability was also done. Two abstractors underwent a 5-hour training session led by the primary researcher who created an abstraction tool. These abstractors were licensed PTs with at least 2 years of clinical experience and have previous or current experience working in a pediatric setting as a PT. During the training session, three charts were chosen to be

abstracted – one jointly by both abstractors and two independently by each individual. Subsequently, all responses were collectively reviewed to address any conflicting entries found on evaluations or charts while discussing expectations. Pilot testing was then administered prior to the main data collection from pediatric institutions.

The sample size was computed using Stata 11.2. Assuming a hypothesized value of 2 children with CP for every 1000 population, an alpha of 0.05, and a power of 90%, with an alternative proportion of 3.6%, the estimated sample size requirement is 93 charts (Oskoui et al., 2013). Simple random sampling via random number generation was used to ensure the randomization of charts reviewed.

Phase 2: Clinical Audit. Callanan et al. (2013) described the clinical audit as a cyclical process outlined in 5 stages illustrated in Figure 2. As this study only aims to identify the most common OMTs used in the clinics to assess function in children with CP and to determine whether the OMTs used in the clinics meet the current standards of assessment, making improvements and sustaining improvements were beyond the scope of this study.

Figure 2. Stages of Clinical Audit (Callanan et al., 2013)

Planning for audit involved identifying stakeholders, audit topics, and planning delivery of audit fieldwork. Stakeholders identified were primarily pediatric PTs in aid of service delivery. In this study, resources from medical charts to examine the documentation necessary for future protocol development and guideline implementation were utilized. Consequently, the primary focus of this study was directed toward evaluating structural aspects related to healthcare delivery. The primary objective of this study was to establish baseline knowledge on the assessment of function in children with CP to improve service delivery. Inclusion and exclusion criteria were then again used to audit the sample. For data collection, the standard used in this study to identify the features of OMTs is presented in Table 1. as developed by Debuse & Brace (2011) and Harvey et al (2008). OMTs identified from Phase 1 were then compared to the standard.

Data Processing and Analysis

The content validity index developed was used to assess the content validity of the abstraction tool by the three experts (Waltz and Bausell, 1983). This was computed by identifying each item (I-CVI) of the abstraction tool as the number of experts giving a rating of 'relevant' for each item divided by the total number of experts, with a goal for each item to be interpreted as appropriate is to have a value of at least 0.50 to be accepted. Meanwhile, inter-rater reliability analysis using the Kappa statistic was used to determine consistency among the two abstractors, with a goal of at least 95% reliability for each item on the data abstraction tool.

The collation of data in this study involved transferring data collected from the data abstraction tool onto a spreadsheet via electronic data collection for interpretation. Microsoft Excel was used for data input, quality control, and management of data for statistical analysis and reporting. A coding system for variables such as demographics was used for ease in coding. As to free texts, the primary researcher and the abstractors agreed to specify the OMT used. Descriptive statistics were used to describe the basic quantitative (numerical) features of data in this study. Information on the distribution of data, mean or average, median, mode, and measures of dispersion were all determined during this study.

Results

Phase 1: Data Abstraction Tool Development

Based on the quantitative and qualitative analysis from the expert panel regarding the content validation forms, the data abstraction tool resulted in the form presented in Figure 3.

Phase 2: Clinical Audit

The total number of CP charts abstracted was 102. Out of these 102 charts, 96 had an initial evaluation, whereas 6 didn't have – which were then excluded as part of the criteria for chart review selection. Eighteen charts (18.7%) used at least one of the three standards by Debuse & Brace (2011), and Harvey et al (2008). On the other hand, 78 (81.3%) were found to use other OMTs to assess function. With the 18 charts abstracted, it was revealed that only the Gross Motor Function Measure (GMFM) was found to be highly utilized for assessment, with none for both Activities Scale for Kids (ASK) and Pediatric Evaluation of Disability Inventory (PEDI).

The percent distribution flow chart of gathered data from abstracted CP charts underpinned in Phase 2 of this study is shown in Figure 3. Representation of the other OMTs most commonly used in the clinics is presented in Figure 4.

Table 1. Features of OMTs

	ASK	PEDI	GMFM
Norm-referenced or Criterion-referenced tool	Norm-referenced tool	Norm-referenced tool; Criterion-referenced tool if to measure functional status	GMFM 88: criterion-referenced tool GMFM 66: norm- referenced & criterion-referenced tool
Function or performance	Function and performance	Function	Function
Activity or Participation	Activity and Participation	Activity and Participation	Activity
Aspect of activity measured	Self-care, play, and mobility	Self-care, mobility, and social function	Gross motor function
Method of administration	Child report and record	Trained therapist records by observing or interviewing caregiver	Trained therapist observes and score
Time to complete (In minutes)	5 to 9	≥45	GMFM 88: 45 to 60 GMFM 66: <45
Training	Not much, as this relies mostly on self- report, rather than direct observation; Questionnaires for both the child or parent is needed and is easily downloadable	Requires training sessions for use of software needed for scoring	Requires a manual, training through a self-instructional CD-ROM, and software for scoring the 66-item version
Clinical Utility	Gives a broad description of function by including self-care and play, along with mobility	Gives a broad description of function by including self-care and social function, along with mobility	Specific to gross motor function

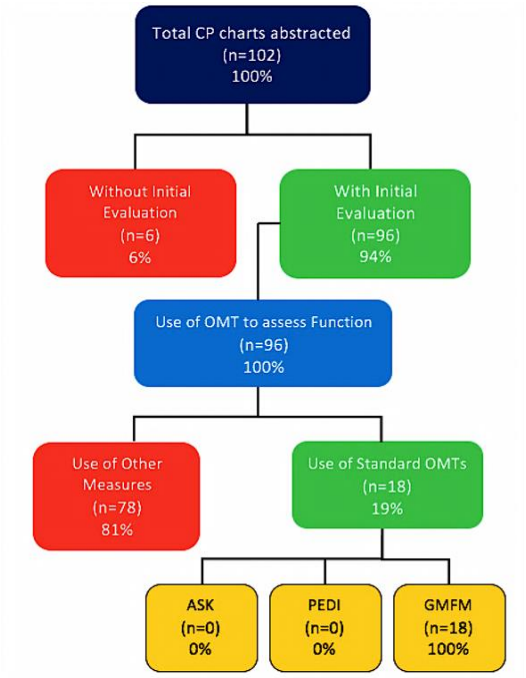

Figure 3. Percent distribution flow chart of gathered data from abstracted CP charts

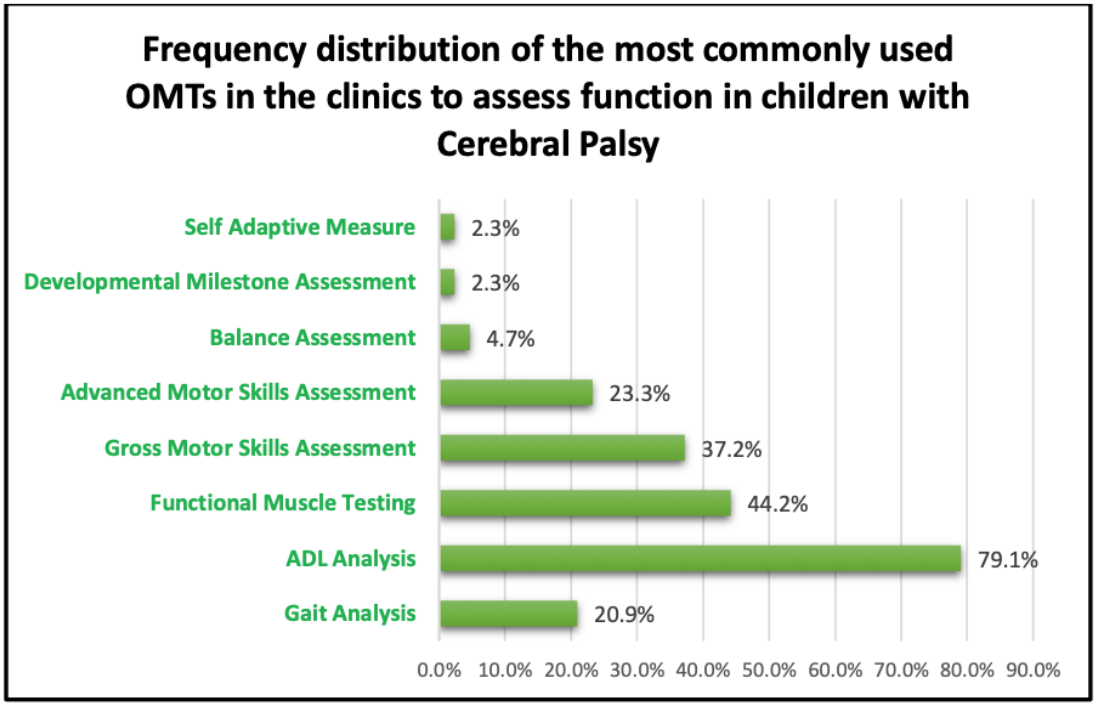

Figure 4. Frequency distribution of CP charts using other measures to assess function

Discussion

This study demonstrated that only 18.7% of the charts analyzed in the initial evaluation utilized one of three standardized assessment tools, specifically the Gross Motor Function Measure (GMFM). According to Alotaibi et al. (2013), both versions of the GMFM, which include an 88-item and a 66-item version, have proven to be effective and valuable in evaluating functional motor abilities among children with cerebral palsy who are under 17 years old. Additionally, both versions can accurately identify significant changes in gross motor function within this population based on several factors such as age, severity of impairment, intervention received, and frequency. These findings underscore the importance of employing reliable measurement tools when assessing pediatric patients with CP. One limitation of both versions of the GMFM is their exclusive focus on gross motor function. Debuse and Brace (2011) emphasize that to obtain a comprehensive understanding of a child's overall functioning, it is essential to supplement these assessments with additional outcome measures. Additionally, the GMFM fails to provide information about a child's real-life motor behaviors within their usual environment since it solely evaluates performance during standardized clinical tests.

Both GMFM and the Pediatric Evaluation of Disability Inventory (PEDI) have been extensively utilized in research studies examining the effects of interventions on children with cerebral palsy (Steinbok, 2001; Seibes, Wijnroks, and Vermeer, 2002). While both measures assess motor abilities, it is important to note that the GMFM was created specifically for children with CP. This assessment tool includes items that are directly relevant to key aspects of impaired movement commonly observed in this population, such as sitting, standing, walking, and jumping. By focusing on these specific activities, the GMFM aims to comprehensively capture functional limitations related to GMF among individuals diagnosed with CP. PEDI on the other hand is designed to assess functional motor abilities in children with chronic illnesses and disabilities. As mentioned by Vos-Vromans et al. (2005), this evaluation tool focuses on measuring the child's ability to engage in self-care activities and mobility tasks. These assessments are conducted through a standardized interview with one of the child's primary caregivers, providing insight into the child's capabilities and performance within their daily environment (Vos-Vromans et al., 2005). In contrast, Rozalkne and Bertule (2014) found that PEDI was considered the most suitable measure for evaluating activities and participation specifically in children diagnosed with CP. This suggests that PEDI can effectively capture changes in a broader range of functional abilities relating to everyday functioning for individuals living with CP.

According to a systematic review conducted by Harvey et al. (2008), the GMFM and Activities Scale for Kids (ASK) were both found to demonstrate reliable psychometric properties. However, in a structured review performed by Morris et al. (2005), it was noted that while ASK can be utilized for children with CP, it is considered a generic OMT originally designed for children aged 5 to 15 years with musculoskeletal disorders. Nonetheless, ASK focuses specifically on assessing the physical functioning of a child, encompassing areas such as personal care activities, dressing abilities, eating and drinking skills, mobility capabilities, play participation levels, skillful stair negotiation performance as well as standing proficiency. Additionally, Rozalkne and Bertule (2014) confirm that ASK is deemed highly suitable for evaluating activities in this population.

In this study, it was revealed that out of the (3) standards used, only the GMFM was highly utilized, and none for both PEDI and ASK. Consistent with this finding, in a study by Vargus-Adams and Martin (2009), it was revealed that GMFM was the highly preferred OMT by medical professionals surveyed to assess gross motor function in children with CP, followed by PEDI then ASK. The same results were also reflected in a survey of pediatric PTs by Hanna et al. (2007), wherein the respondents were asked to indicate up to (3) measures that they frequently used – which revealed that 28.4% used GMFM, and 1.8% for PEDI. ASK, on the other hand, was not even mentioned in that study by Hanna et al. (2007).

As to the other measures used often, with 81.3% of the overall charts abstracted with an initial evaluation, it was revealed that all these charts used a descriptive type – with activities of daily living (ADL) analysis being the most common measure with 79.1%. To accurately measure function and to produce valuable outcomes, the use of valid and reliable OMTs is a must. Although descriptive measures are cost-effective, quick to administer, and very easy to do, it was pointed out in a study by Carpio et al. (2010) that this type of assessment may lead to ambiguity resulting in erroneous findings, and is associated with a lack of discernment, bias, and recall errors, hence a lack of objectivity.

Standardized OMTs in the field of PT have gained significant recognition and are emphasized by CPGs in various countries (Al-Muqiren et al., 2017). The evaluation of PT outcomes is essential for professional accountability, as it ensures transparency during the diagnostic process and contributes to effective patient care planning based on clinical reasoning. Consequently, these guidelines often include specific recommendations for using standardized OMTs. While there is extensive research on implementing CPGs into healthcare, previous studies lacked focus on the implementation of measurement instruments within the practice of PT. However, recent studies have addressed this knowledge gap by exploring different approaches to enhance their implementation.

While PTs acknowledge the significance of incorporating standardized measures into evidence-based practice, they encounter numerous challenges in terms of selecting, utilizing, and interpreting information obtained from these measures. According to Cochrane et al. (2007), there are seven categories of barriers that can hinder the implementation of standardized assessments in everyday clinical practice. These include challenges related to supports and resources, cognitive and behavioral factors, healthcare professionals themselves, system processes, attitudes and beliefs held by clinicians, CPGs and available evidence, as well as patient-related factors. Furthermore, it was revealed in a study by Oeffinger (2009) that clinicians face challenges in applying OMTs in the clinics such as limited knowledge about appropriate assessment tools, uncertainty about the usefulness of outcome measures in clinical practice, and constraints related to time and resources. Consequently, clinicians often rely on familiar or readily available measures instead of selecting the most theoretically optimal ones. As a result, consistent and comprehensive use of OMTs by clinicians is not always achieved.

Limitations

As mentioned in the background of this study, there has been no study on the prevalence & incidence of CP in the Philippines. By having an appropriate and accurate source of baseline data, a better representation of this population can be used for future studies to generate evidence in the rehabilitation of children with CP in the Philippines.

Another limitation from this study was that data was obtained from different pediatric institutions within Metro Manila with varying protocols for assessment or lack thereof – which ties into the purpose of this clinical audit.

Implications and Recommendations

As mentioned in the results of this study, it was revealed that most charts used a descriptive type to assess function in children with CP, with only a few using one of the three standards. This research has value to generate more evidence in aid of service delivery for this population. Furthermore, this study provides a better understanding of the current practice to assess this population by pediatric PTs. Hence, valuable outcomes from interventions can now be guided with the use of appropriate OMTs suitable for the needs of a child with CP.

Being the first of its kind to study the measures of function in children with cerebral palsy in Metro Manila, this research has value in informing service delivery in the pediatric rehabilitation system. Furthermore, this study can be used as a baseline data for future studies in the care of children with cerebral palsy such as: (1) generating new evidence, (2) factors that may limit the use of the current standards of OMTs in the Philippines, and solutions to overcome this limitation, (3) applicability of the three (3) standard OMTs in clinical practice, (4) standardization of PT assessment, (5) development of a clinical practice guideline for PT assessment, (6) confirm treatment effects of commonly used PT interventions, and (7) development of a clinical practice guideline for PT interventions based on the appropriate use of standard OMTs.

It is recommended that the three (3) standardized OMTs (GMFM, ASK, and PEDI) may be of great value in the clinics to measure function in children with CP. That can be done through capacity-building efforts for Filipino PTs on the clinical utilization of using standardized pediatric OMTs. Furthermore, another recommendation is to conduct a larger audit scale in light of future studies to develop a CPG in the care of children with CP in the Philippine setting.

Conclusion

This study was able to pool 96 CP charts with an initial evaluation, which met the estimated sample size requirement of 93 charts.

With the first objective of this study, the findings showed that out of these 96 charts, 78 (81.3%) used a descriptive type of outcome measure to assess function in children with CP. Furthermore, among the three (3) standards of assessment tools, the Gross Motor Function Measure (GMFM) was revealed to be the only used standardized tool in this study. As to the second objective of this study, it was revealed that the pediatric institutions that agreed to participate in this study did not meet the current standards of assessment, as only eighteen charts (18.7%) used at least one of the three (3) standards of assessment tools to assess function in children with CP.

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Appendix A

Parts of the Data Abstraction Tool