19458765448 22066702.770492 90275140728 3530888073 19780380862 44588025.212121 30200498.457143 19069429.333333 18202865.361702 67652843280 30343867.926829 51796222 69175748915 43210552740 11017288035 33482492648 10217250806 3704055.6 8438201775 17761919.978495 29574108.888889 16599624.348837 47499405.795455 114845125248 12689672688 136867972766

Holistic Evaluation of Cerebral Palsy

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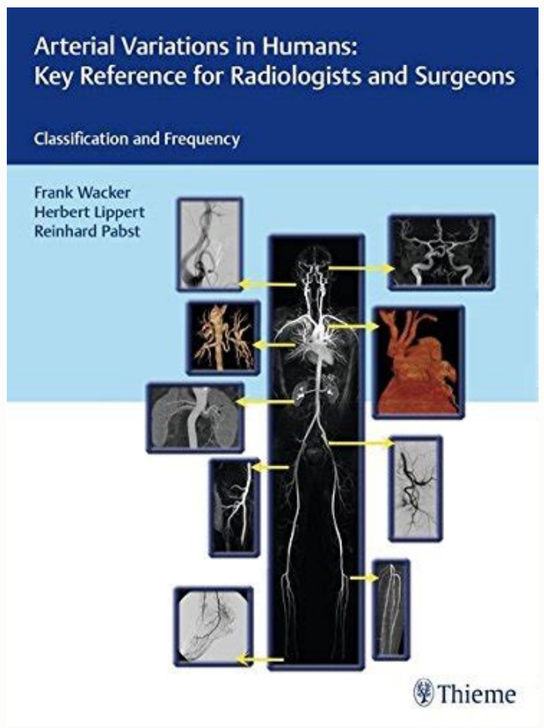

INTERVENCIÓN FISIOTERÁPICA EN PARÁLISIS CEREBRAL EN EL ÁMBITO DE LA CLASIFICACIÓN INTERNACIONAL DEL FUNCIONAMIENTO (CIF): Objetivos de tratamiento

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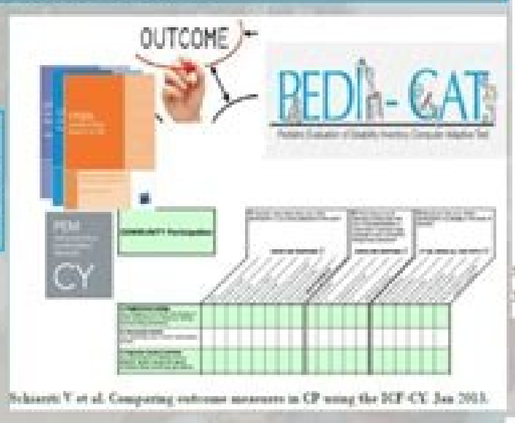
INTRODUCCION

La intervención en personas con parálisis cerebral ha evolucionado de forma intensa en los últimos quince años. Desde la aprobación de la Clasificación Internacional de Funcionamiento (CIF) por la Organización Mundial de la Salud en 2001, el concepto de discapacidad ha experimentado un gran cambio hacia los conceptos de funcionamiento, participación y su relación con el medio ambiente físico y social. Esta evolución, inicialmente filosófica e ideológica, se está transformando rápidamente para poder traducirla en la práctica clínica diaria, especialmente a través del Conjunto Básico específico para niños y jóvenes con parálisis cerebral.

POBLACION
Conjunto Básico de la PC, Clasificaciones de Actividades y Análisis Intelectual

Schiariti V et al. ICF Core Sets for Children and Youth with Cerebral. Dec 2014.
Mompará H et al. Multiprofessional evaluation in clinical practice. Oct 2016.

OUTCOME
Objetivos de intervención que supongan un impacto en la participación, el funcionamiento y la calidad de vida. Y FAMILIA



Schiariti V et al. Comparing outcome measures in CP using the ICF-CY. Jun 2015.

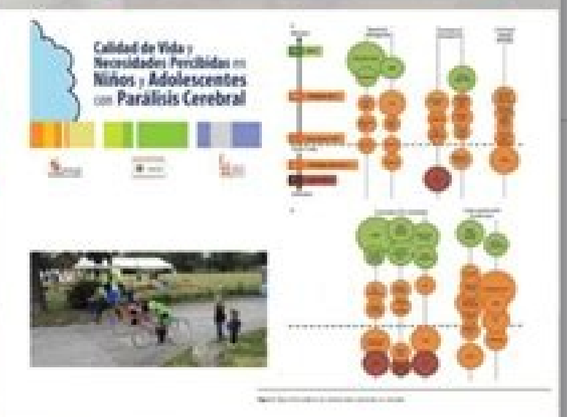
INTERVENCIÓN
Actuaciones que generen impacto positivo en la participación y calidad de vida de la población y sus familias.

METODOLOGIA

Revisión de la evidencia mediante la selección de ensayos clínicos aleatorizados de alta calidad (PEDro>6) relacionados con intervención fisioterápica en niños y adolescentes con parálisis cerebral (PC). 42 artículos seleccionados.

https://pediatricapta.org/includes/fact-sheets/pdfs/13%

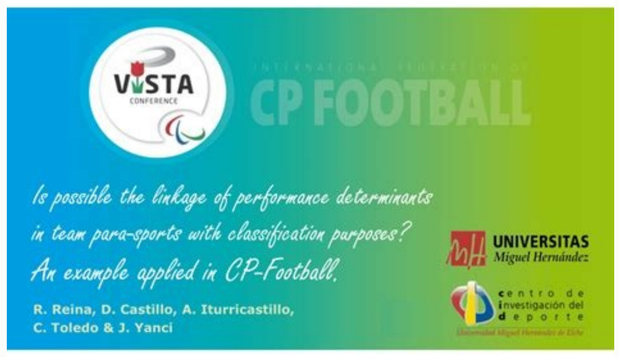
COMPARACIÓN
Herramientas de valoración sensibles al con-trol adecuado



Novak I et al. A systematic review of interventions for children with CP. Aug 2013.
M Badia et al. The influence of participation in leisure activities on quality of life in Spanish children and adolescents with Cerebral Palsy. Sep 2013.

RESULTADOS

Población de jóvenes con parálisis cerebral descrita por topografía (hemiparesia y diparesia) sin evaluar funcionamiento, actividades o discapacidad intelectual.
- Objetivos de intervención relacionados con estructuras y funciones (55%) más que con actividades (40%%) y participación (5%).
- Población más investigada, niños con parálisis cerebral hemiparésica. No se analizan otros aspectos de comorbilidad (Badia M et al. Relationship of cerebral palsy comorbid conditions with participation and quality of life).
- La descripción de las poblaciones investigadas es insuficiente y sólo un 10% de los artículos incluyen clasificaciones estandarizados



Desarrollo.

Historia y Fundamento del concepto Bobath.

1.1 Creadores del Concepto Bobath.

Berta Bobath, fisioterapeuta junto a su esposo el Doctor Karel Bobath, ambos nacidos en Berlín, fueron quienes a finales de 1940 y principios de 1950 desarrollaron el Concepto Bobath para el tratamiento a niños y adultos con trastorno neuromotor, desarrollando este concepto en base a un meticuloso análisis en el movimiento corporal humano y buscando las bases neurofisiológicas del mismo, las cuales en esos tiempos eran muy limitadas.

1.2 Fundamentos del Concepto Bobath.

La justificación de la práctica actual se basa en parte en los conocimientos actuales de control motor, aprendizaje motor, la plasticidad neuronal y muscular, y la biomecánica[2]. También se basa en la experiencia de expertos clínicos y tomando en cuenta las necesidades del cliente y las expectativas en cuenta. Se centra en que el paciente empieza la producción del movimiento guiado por un Fisioterapeuta, en el cual participa el cuerpo en conjunto y cada parte del mismo. El enfoque está principalmente indicado para el tratamiento de pacientes con trastornos neurológicos, pero puede ser empleado en otros casos, incluyendo el tratamiento de ortopedia o reeducación del movimiento.

Se busca obtener y establecer patrones típicos del movimiento y lo más posiblemente funcionales para el paciente en especifico, lo que significa que cada Fisioterapeuta debe sustentarse en las bases teóricas y prácticas de este Concepto pero modificarlas en beneficio de la persona que está recibiendo el tratamiento, este enfoque a avanzado gracias a los logros actuales de la neurociencia y rehabilitación, haciendo un mayor énfasis en la función, siendo que hoy en día, la práctica del Concepto Bobath incorpora el movimiento orientado a la tarea, es decir, se dirige al aprendizaje de habilidades motoras significativas

[2] Sackett DL, Starus S, Richardson WS, et al. Evidence-based medicine. How to practice and teach EBM. San Diego: Harcourt-Brace, 2000.

Classification of cerebral palsy pdf.

Minear WL. A classification of cerebral palsy. A number of these functional scales have been validated by multiple studies [11, 12, 13, 14, 15, 16]. Philadelphia: Saunders; 2015. The Journal of Pediatrics. It does not indicate the nature of the motor abnormality, the topography, the etiology, or neuropathologic substrates which in their own respects are important descriptive information. The bottom line is that neuroimaging can be used to identify the neuropathologic substrates of the various etiologic and risk factors of CP, possibly provide information about timing of insults and detect cerebral dysgenesis or malformations but, at present, a comprehensive neuropathologic classification is still in the pipeline.This scheme categorizes CP cases based on treatment needs into four groups namely: non-treatment, modest treatment, need for a CP treatment team, and pervasive support groups [6, 20]. For instance, children on MACS levels I and II handle objects independently and do not require any adaptive device to handle objects. The upper limit of 12 years (before end of adolescence) was a limitation of the first version, and the GMFCS was revised and expanded in 2007 by Palisano et al. Palisano RJ, Rosenbaum P, Bartlett D, Livingston MH. Content validity of the expanded and revised gross motor function classification system. 2014;56:245-251. Plasschaert VF, Ketelaar M, Nijnuis MG, Enkelaar L, Gorter JW. Classification of manual abilities in children with cerebral palsy under 5 years of age: How reliable is the manual ability classification system? Moreover, the imprecise use of these terms in clinical practice has been reported by Gorter et al. Morris C, Kurinczuk JJ, Fitzpatrick R, Rosenbaum PL. Reliability of the manual ability classification system for children with cerebral palsy. Nosology and classification of cerebral palsy. It was initially assumed that the presence of neuronal migrational disorders meant that the insult occurred in the first half of pregnancy while the presence of a glial response indicated insults around the second half of pregnancy [27]. For instance, diplegia suggests periventricular leukomalacia due to prematurity/low birth weight; hemiplegia suggests perinatal stroke, periventricular hemorrhagic infarction or neonatal cortical infarction while quadriplegia suggests severe perinatal asphyxia at term, postnatal infection (bacterial meningitis) and metabolic/genetic disorders [19]. The increased resistance to this passive movement is felt all through the movement. Geneva: WHO; 2001. These risk factors or associated etiological factors in CP include genetic abnormalities, cerebral dysgenesis, multiple gestation, intrauterine/congenital infection (TORCHS), maternal infection (UTI), prematurity, low birth weight, perinatal asphyxia (HIE), bilirubin encephalopathy, postnatal CNS infections, etc. The clinical manifestations of CP are heterogeneous as rightly pointed out in the most current definition of CP [1, 2]. This need or use of adaptive mobility equipment is acceptable (current thinking) [5]. 2006;48:950-95316. The Collaborative Perinatal Project [25] identified the associated risk factors for CP. Due to the fact that much of the data in these epidemiological studies [25, 26] are still correlational, “risk factors” are more appropriate than etiology. This is the so-called mixed CP subtype. It is immediately obvious that this classification combines the Minear’s Physiologic and Topographic schema. The ICF model has been used to guide clinical thinking and service delivery to patients with CP [4]. By this classification, spastic quadriplegia and spastic diplegia are classified as bilateral spastic CP (BS-CP) while spastic hemiplegia is termed unilateral spastic CP. This classification is easy to apply and is more reliable than the earlier traditional classifications. The five-level scale classifies the safety and efficiency of eating and drinking while the three-level scale classifies level of assistance required to bring food and drink to the mouth. Eliasson AC, Ullenhag A, Wahlstrom U, Krumlinde-Sundholm L. Mini-macs: Development of the manual ability classification system for children younger than 4 years of age with signs of cerebral palsy. The management is multidisciplinary depending on the nature and number of accompanying impairments. Each classification used alone is incomplete. Nottidge VA, Okogbo ME. Cerebral palsy in Ibadan, Nigeria. Furthermore, the topographic classification does not consider functional abilities and so does not aid therapy or inform management of these children [6, 20]. It is an ordinal scale that categorizes a child’s mobility/ambulatory or lower limb function in five levels ranging from walking without restrictions (level I) to inability to maintain antigravity head and trunk postures (level V) [11]. The etiology of CP is multifactorial, and the causal pathways are (mechanisms) multiple and complex. For instance, the GMFCS is used to ascertain the requirements for ambulation appropriate for the age of the child and gross motor functional abilities while the MACS helps ascertain appropriate upper limb interventions for independent performance of activities of daily living. Generally, it is desirable that any classification used should be reliable, valid, quantitative, and objective and most importantly assist management [1].Besides early identification and intervention, the current trend in neurodevelopmental pediatrics is a focus on functional effects of different states of health [3, 4]. Michael VJ. Encephalopathies. This classification is a combination of classifications based on topography and physiology and so has the same advantages and shortcomings as the topographic and physiologic classifications.The SCPE [10] classifies CP into the following four subtype groups: spastic (bilateral and unilateral), dyskinetic (dystonic and choreoathetotic), ataxic, and non-classifiable. 1986;315:81-8627. This distinction is highly subjective since it is unclear how much upper limb spasticity is needed to separate a diplegia from a quadriplegia [6, 20]. [28] continues to correlate neuropathologic findings with different clinical types of CP. For example, dyskinesia correlated with lesions detected by MRI in the thalamus and putamen due to HIE and in the globus pallidus and hypothalamus due to kernicterus.There are also difficulties in estimating the timing of insults in CP using neuroimaging findings. Bax et al. It provides information that will permit comparison of CP cases in different locations. It classifies everyday communication performance of an individual with CP into five levels ranging from effective communication in all settings (level I) to ineffective communication even with familiar partners (level II). A consensus on what characteristics/components such holistic classification should incorporate is yet to be reached by experts in the field of CP.AdvertisementThe traditional classifications of CP are basically the Minear [7] classifications in seven axes namely:PhysiologicalTopographicSupplementalAetiologicNeuroanatomic (radiologic)TherapeuticFunctionalThis is based on the type/nature of motor or movement disorder (quality and changes in tone) and classifies CP into two types: spastic (pyramidal) and non-spastic (extrapyramidal). 2000;42:292-29613. Ganong WF. Control of posture and movement. Therefore, in simplistic terms, these current classifications tell us what to do to the child with CP. A summary of all groups of classifications is shown in Tables 1, 2, 3.Classification axisCriterion/characteristic usedInter rater/inter observer reliabilitySuitability for research (description, comparison/stratification) (on a scale of 1–5)Indication of functional abilitiesAiding/guiding current managementPhysiologicalType of motor/movement abnormality (quality and changes in tone)Poor++NoNoTypographicDistribution/localization of motor impairmentPoor++NoNoSupplementalAccompanying impairmentsNot reportedNot reportedNoYesAetiologicActual cause and timing of insultNot availableNot availableNot availableNoNeuroanatomicBrain structural alterations on neuroimagingNot availableNot availableNot availableNoTherapeuticIndividual treatment needsNot reportedNot reportedNoNoFunctionalDegree of severity/activity limitationGood+++ (good)Yes. Children. The objectives of this chapter are to review the various classifications of CP, to highlight the clinical features used in the various classifications, to outline the recent functional classifications of CP and to highlight how these recent classifications guide current management. Other types of spastic CP such as tripegia (three-limb spasticity) and monoplegia (one-limb spasticity) are rare, and double hemiplegia (four extremity involvement with greater spasticity of the upper limbs) is no longer in use [6, 20].An advantage of this classification is that these topographical subtypes can be linked to some etiological factors. It is expected that at the end of this chapter, the reader should be able to understand the difficulties in classifying CP, enumerate and discuss the various classifications of CP, understand the merits and shortcomings of each classification scheme, clinically evaluate and classify a child with CP multiaxially and understand how functional scales predict current and future needs of children with CP.clinical classificationcerebral palsyfunctional scalesmanagementspasticextrapyramidalSCPEGMFCSMACSCFCSEDACSmultiaxialThe categorization of children with cerebral palsy (CP) into clinical groups remains a challenge, hence the presence of so many classifications that are not comprehensive and the continued search for a holistic classification [1]. World Health Organization. Unfortunately, the supplemental disorders correlated poorly with the two earlier classifications. Currently, the emphasis on the functional classification is due to its important role in the management of CP. So there is a rekindled interest in this scheme.The functional classification remains the best classification of CP because it is a useful guide to providing care for patients appropriate for their functional level and helps clinicians set and discuss with parents/caregivers realistic rehabilitation goals [1, 4, 5, 11, 12]. A summary of the criteria for the GMFCS [11, 32] is as follows:Level I—Walks without limitations.Level II—Walks with limitations.Level III—Walks using hand-held mobility device.Level IV—Self mobility with limitations; may use powered mobility.Level V—Transported in a wheelchair.Gross Motor Function Classification System—Expanded & Revised (GMFCS—E & R). For instance, spasticity would suggest damage to the cortical neurons (pyramidal cells) due to hypoxic ischemic encephalopathy (HIE) from severe perinatal asphyxia and postnatal central nervous system (CNS) infections like meningitis [19]. This implies categorizing CP patients based on neuroradiologic findings. American Journal of Diseases of Children. 22nd ed. The answer is usually a “yes.”The quality of the increased tone is described as “clasp-knife” spasticity and is elicited clinically by a rapid passive movement at a joint (as rapidly as the time taken to say “one thousand and one”). Thus, it shares the same merits and demerits as the physiological and topographic classifications as earlier discussed.According to the Edinburgh classification [9], there are six subtypes of CP namely hemiplegia, bilateral hemiplegia, diplegia, ataxic, dyskinetic and other forms of CP including mixed forms. There is a consensus in the literature that the therapeutic and functional classifications are the most important to the patient [1, 6, 20].However, the therapeutic classification simply identifies how much treatment or the extent of interventions a given child requires without specifying what is actually needed to improve function. The accompanying physical, mental or physiological impairments in CP include epilepsy, cognitive (intellectual), speech, visual and hearing impairments, behavioral problems and secondary musculoskeletal abnormalities (hip dislocation/subluxation, contractures) [1, 2]. Wood EP, Rosenbaum PL. The gross motor function classification system for cerebral palsy: A study of reliability and stability over time. The arm and leg naturally perform different functions, and assessing the relative severity of involvement is difficult [1]. Rosenbaum P. Cerebral palsy: What parents and doctors want to know. Paulson A, Vargus-Adams J. Overview of four functional classification systems commonly used in cerebral palsy. Archives of Disease in Childhood. It is more accurate to refer to these as “predominantly spastic” and “predominantly non-spastic.” Due to the complex interactions of the upper motor neuron system (the pyramidal, extrapyramidal, and cerebellar pathways) with the anterior horn cells to control posture and movement, lesions causing CP in real life usually involve both pyramidal and extrapyramidal pathways [21]. Eliasson et al. 1996;41:337-35710. [1] are applicable currently. Iloeje SO, Ogoke CC. Factors associated with the severity of motor impairment in children with cerebral palsy seen in Enugu, Nigeria. These associated etiological factors can be classified according to the timing of insult as prenatal (commonest), perinatal and postnatal [6, 19, 20].Identifying both the disturbances or events and causal pathways or processes that led to the damage to the developing motor system remains a challenge [6, 20]. They include Gross Motor Function Classification System (GMFCS) [11] (functional mobility/ambulatory function), Manual Ability Classification System (MACS) [14] (hand and arm function/manual dexterity), Communication Function Classification System (CFCS) [16] (speech/communication function) and Eating and Drinking Ability Classification System (EDAC) [17] (eating and drinking/oropharyngeal function). Thus, a hand-held mobility device may be provided initially for the child on level II. Therefore, the management of patients on GMFCS levels I and II would focus on appropriate stimulation, preventing complications from occurring and treatment of accompanying impairments. Surveillance of Cerebral Palsy in Europe. Therefore, by improving the reliability of the terms used in the topographic component of this classification, the SCPE currently seems to be the best traditional classification for description of patients with CP.However, the SCPE classification [10] does not include functional abilities and so does not aid therapy for patients with CP. Hence, this classification currently has not had a similar level of advocacy as the functional classifications.AdvertisementCurrently, functional classification of each case of CP is internationally advocated due to its important role in management. It is generally recommended that the presence or absence of these impairments and the extent to which they interfere with function be recorded in addition to the classifications used [1]. The ICF is a new classification system for health and disease that is universal (for everybody not only people with disabilities) [3]. 1985;139:1031-103826. Besides, extrapyramidal hypertonus can be diminished by repetitive movement and this is called “shaking it out.”Deep tendon reflexes are usually normal or mildly increased (grade 1+ to 3+).A negative Babinski sign.Unsustained ankle clonus.Positional contractures (the variable tone is protective against contractures and so contractures like hip/knee flexion contracture only occur after prolonged periods on a wheelchair).Movement is disordered. Developing and validating the Communication Function Classification System (CFCS) for individuals with cerebral palsy. 1956;18:841-8528. ICIDH-24. Therefore, Bax et al. Suppl 1989;4:12-179. This is the outcome of the recent WHO International Classification of Functioning, Disability and Health (ICF) which in the field of CP led to the development of newer measures of functional abilities (functional scales) [3, 4]. 2000;42:816-82411. [17] in 2014 and comprises two ordinal scales that describe eating and drinking ability in people with CP from 3 years of age. This means that the same child may be classified differently at different times (due to changes in peripheral manifestations with age), by different people (due to variable historical data from maternal recall or case notes), and in different regions (due to differences in availability and affordability of neuroimaging and metabolic studies). Therefore, the etiological classification was severely limited and failed in addressing prevention [6, 20].This classification correlates specific radiologic findings (brain structural alterations) with types of CP [6, 20]. This is further confirmed by asking caregivers whether their child feels stiff when touched or held most times of the day even during sleep. DOI: 10.1016/j.spen.2004.01.0025. From the explanation above, this CP subtype should actually be very common but from published studies [22, 23], spastic CP remains the commonest type thereby exposing the subjectivity and imprecision in assessment of patients based on this classification. Seminars in Pediatric Neurology. Thus, extrapyramidal CP is also called dyskinetic CP.There is a four-limb functional impairment that precludes further topographic classification. The categorization of the effectiveness of current communication is based on the performance of sender and receiver roles, the pace of communication, and the type of conversational partner. Its strengthComparison of traditional (Minear’s) classifications based on single variables.ClassificationMinear’s classifications combinedCriteria/characteristics usedInter rater/inter observer reliabilitySuitability for research (on a scale of 1–5)Indication of functional abilitiesAiding/guiding current managementSwedish classificationPhysiological and topographicType of motor abnormality + localization of motor impairmentPoor++NoNoEdinburg classificationPhysiological and topographicType of motor abnormality + localization of motor impairmentPoor++NoNoSCPE ClassificationPhysiological and modified topographicType of motor abnormality + localization of motor impairment as unilateral and bilateral only.Fair+++NoNoComparison of traditional classifications based on multiple variables.ClassificationCriterion/characteristic usedInter rater/inter observer reliabilitySuitability for researchIndication of functional abilitiesAiding/guiding current managementAge range included (year developed)Nature of scale(s)GMFCSGross motor/ambulatory/lower limb function (current gross motor abilities/activity limitations)GoodYes (valid and reliable)YesYesGMFCS (birth–12 years) (1997) GMFCS-E&R (birth–18 yreas) (2007)Ordinal (5-level)MACSManual dexterity/upper limb function (usual performance in handling objects with two hands).GoodYes (valid and reliable)YesYesMACS (4–18 years) (2006) Mini-MACS (1–4 years) (2016)Ordinal (5-level)CFCSCommunication function (everyday communication performance)GoodYes (valid and reliable)YesYes≥3 years. The three-level scale is categorized into independent, requires assistance, and dependent for eating and drinking. DOI: 10.1111/dmcn.1235218. Therefore, different groupings (classifications) are possible [1]. nature and typology of motor disorder and b. Despite this, the American Academy of Neurology (AAN) recommends neuroimaging studies on all children with CP whenever possible [27]. [27] classified abnormal radiological findings and diagnoses into five categories namely: malformations, gray matter damage, white matter damage, ventriculomegaly, atrophy or CSF space abnormalities and miscellaneous findings.Though the correlations between the neuropathologic substrates and clinical types have been weak and inconsistent, recent advances such as diffusion tensor imaging, magnetic resonance spectroscopy, functional magnetic resonance imaging and fast spin echo imaging have improved greatly the possibility of a comprehensive radiologic classification [6, 20, 27]. Oski’s Pediatrics, Principles and Practice. DOI: 10.1017/s0012162205001122. 2008;50(10):744-750. Can Child Centre for Childhood Disability Research, McMaster University33. Therefore, the clinical classification of CP needs to use many axes to be comprehensive. [19, 25, 26]. 2006;48:549-55415. [31] posited that the mini-MACS is probably not sensitive to changes and should therefore not be used to evaluate development or intervention, but rather to categorize how suspected CP affects the manual abilities of children 4 years and younger.The CFCS was developed and validated by Hidecker et al. Reproduced with permission.These general headings or titles for each level represent the method of mobility or highest level of mobility that a child with CP is expected to achieve after 6 years of age [11].Current management of CP involves a liberal use of adaptive/augmentative equipment in addition to impairment-based treatment approaches to achieve independence [5]. 2016;59:72-78. World Journal of Pediatrics. Physical Medicine and Rehabilitation Clinics of North America. pp. 202-22222. The classification by SCPE provides enough clinical descriptive information about children with CP while the supplemental and functional classifications are useful for management and service delivery. DOI: 10.1177/088307380730798328. They have been validated by studies [12, 13, 15] and shown to be objective and reliable clinical classification systems for CP. They have replaced previously used imprecise and subjective functional classifications of CP into mild, moderate and severe.Their development resulted from the paradigm shift from a focus on body structure and function (impairment-based assessments and treatments) to current emphasis on activity or participation (function and social engagement) [3, 4, 5]. It is a new way to consider health conditions and posits an interactive relationship between health conditions and contextual factors (environmental and personal factors) in which all components are linked together [3, 4]. [11] and described gross motor functional abilities and limitations in children aged less than 12 years. DOI: 10.1111/j.1469-8749.2008.03089.x14. This produces the classic “clasp-knife” resistance followed by a sudden “give.” Spasticity refers to hypertonia due to a velocity-dependent increase in tonic spinal stretch reflex.Deep tendon reflexes are markedly increased (more commonly grade 3+ or 4+)A positive Babinski sign (extensor planter response), that is, lightly stroking the lateral aspect of the sole and across the foot pads/ball of the foot, results in extension/dorsiflexion of the hallux (up-going big toe) and fanning out/spreading of the other toes.Sustained ankle clonus, that is, when the ankle is briskly dorsiflexed on a flexed knee, a rhythmic contraction is observed.Non-positional contractures (due to persistent hypertonia)Decreased movementLocalization/limb distribution of neuromotor impairment varies from one child to another and so spastic CP can be further classified topographically.In contrast, the clinical features of extrapyramidal (non-spastic) CP are [6, 18, 19]:Tone is variably increased (varies from hypertonia to hypotonia) depending on the state, that is, tone is increased by activity, agitation, tension, and emotions like crying, but tone is decreased in sleep and when relaxed. Recall that there is involvement of the four limbs in both subtypes. A classification may be used for describing the nature of the disability, for predicting current and future management needs, comparing cases in different areas and assessing change following an intervention [1]. This current version of GMFCS [32] emphasizes the concepts inherent in the WHO’s International Classification of Functioning, Disability and Health (ICF). The child on GMFCS level III will require adaptive equipment for low back support for floor and chair sitting and at about 6 years, a hand-held mobility device for walking indoors and a self-propelled manual wheelchair for mobility outdoors and in the community. (2011)Ordinal (5-level)EDACSEating & drinking ability/oropharyngeal/swallowing function (safe and efficiency of eating and drinking and level of assistance required)GoodYes (valid and reliable)YesYes2–12 years. In a systematic review of neuroimaging for cerebral palsy, Korzeniewski et al. Therefore, the topographic and physiological classifications share similar merits and demerits.This is an additional grouping that comprises the accompanying impairments in CP and their association with the physiological and topographic classifications [6, 20]. Furthermore, the most recent definition of CP [2] highlights the importance of these accompanying impairments by incorporating them as part of the definition of CP since CP rarely occurs without them. The children on level III require some assistance and sometimes adaptive equipment for independent handling of objects. They classify children’s usual performance in handling objects with two hands (not best use or individual hand function) in important daily activities (Figures 3 and 4).The Manual Ability Classification System (MACS). The EDACS assists in identifying the appropriate food texture to give a particular child, need for assistance, the risks involved in eating and drinking and the appropriate method of feeding (oral/tube feeding). The functional classification satisfies the needs of patients and parents/caregivers by informing the current and future service needs of children with CP [5]. Children on level IV require continuous assistance and adaptive equipment while those on level V need total assistance. This explains the little emphasis on the therapeutic classification.Functionally, CP is classified into levels of severity based on functional (motor) abilities and/or limitation of activity [1, 6, 20]. It is widely accepted that the functional classification is the best classification for the patient because it guides management. 4th ed. The terms spastic (pyramidal) and extrapyramidal CP are strictly incorrect [6, 18, 20]. They are simple and easy to apply both by healthcare professionals and care givers and are good for clinical use and patient stratification for research purposes [5, 11, 30]. Caregiver usually tells the clinician that their child limbs feel normal when asleep or quiet.The quality of the increased tone is “lead pipe” rigidity or “candle wax” type and is elicited clinically by a slow passive flexion and extension of a limb. It represents a coherent view of health from biological, individual and social perspectives (a biopsychosocial approach to health, functioning and disability) [4]. Reproduced with permission [14].The mini-Manual Ability Classification System (mini-MACS). Giorn Neuropsich Eta Evolution. Shapiro BK. Cerebral palsy: A reconceptualization of the spectrum. 2008;2(3):120-12224. DOI: 10.1111/j.1469-8749.1997.tb07414.x12. The use of the functional scales in clinical context (to aid management) and in research is in accordance with current thinking and the reconceptualization of the management of CP.AdvertisementEach classification system used in CP has its merits and shortcomings. For instance, the combination of accompanying impairments—vertical gaze palsy, sensorineural deafness and enamel dysplasia—is associated with choreoathetoid CP (physiology) from damage to the basal nuclei by bilirubin encephalopathy (etiological factor) [6, 20].Though these associations were limited and the aim of the supplemental classification defeated, supplemental disorders (accompanying impairments) remain pertinent to the current management of CP because their presence strengthens the need for multidisciplinary management. Nelson KB, Ellenberg JH. Antecedents of cerebral palsy 1: Univariate analysis of risks. Reproduced with permission [17].AdvertisementThe final goal of a managing doctor and the final hope of a patient and his family is an ambulatory self-dependent individual. This is a rare form of CP [6, 18, 19].One merit of the physiological classification is that it can suggest the areas of brain damage and possible etiological factors. This grouping also combines the physiological and topographic classifications. Thanks too to my beautiful wife Mrs. They includeGross Motor Function Classification System (GMFCS) [11]Manual Abilities Classification System (MACS) [14] & Mini—MACS [31]Communication Function Classification System (CFCS) [16]Eating & Drinking Ability Classification System (EDACS) [17]There are other functional scales like the Functional Mobility Scale (FMS), Bimanual Fine Motor Function (BFMF), Functional Assessment Questionnaire (FAQ), the Pediatric Orthopaedic Society of North America Outcomes Data Collection Instruments (PODCI), etc.However, the first four are more commonly used and will be discussed here.This is the most widely used clinical functional classification of CP [1]. The recent WHO International Classification of Functioning, Disability and Health (ICF) emphasizes the importance of focusing on the functional consequences of various states of health and has stimulated the development of newer functional scales in CP. DOI: 10.7196/SAJCH.2017.v11i3.124630. DOI: 10.1111/dmcn.1316232. Ogunlesi T, Ogundeyi M, Ogunfowora O, Olowu A. Socio-clinical issues in cerebral palsy in Sagamu, Nigeria. The five-level scale is based on the range of food textures eaten, the presence of cough and gag when eating or drinking, and the control of movement of food and fluid in the mouth. Journal of Child Neurology. This means that the accompanying impairments need to be taken into consideration in planning service delivery. 2003;326(7396):970-9746. Therefore, the physiological classification is still clinically useful.However, the physiological classification is not reliable [6, 18, 20]. In ascertaining the current level of communication, the CFCS aptly considers and includes use of all methods of communication. pp. 1910-191719. In: Behrman RE, Kliegman RM, Stanton BF, St Geme JW III, Schor NF, editors. Eliasson AC, Krumlinde-Sundholm L, Rosblad B, Beckung E, Arner M, Ohrvall AM, et al. 2008;23(2):216-227. They are basically ordinal scales to categorize functional abilities or severity of limitation of activity and are not used as outcome measures, tests or assessments [14, 30]. These clinical variables form the basis of the traditional classifications of CP. In 1956, Minear [7] and the Nomenclature and Classification Committee of the American Academy for cerebral palsy classification put forward an early classification system that presented seven classification axes based on the aforementioned features.Subsequent classification systems originated from the Minear classifications and are either a combination or an expansion of the categories. 2011;53(8):704-710. This chapter is distributed under the terms of the Creative Commons Attribution 3.0 License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. [1] in 2005 proposed that all classification results should indicate these factors at the time of classification.Children with CP differ clinically in the following characteristics: type/nature of motor disorder, distribution of motor impairment, etiology, presence/number of accompanying impairments, structural brain abnormalities on neuroimaging, degree of severity of impairments, and individual therapeutic needs. [31] to obtain the mini-MACS which was shown to have excellent inter-observer reliability. functional motor abilities)Associated impairmentsAnatomic and radiologic findingsCausation and timing.Currently, there are obvious limitations with categorization of neuroimaging findings and identifying specific causes of CP. Therefore, as we await comprehensive and acceptable neuroanatomic and etiologic classifications, the minimum acceptable multiaxial classification of CP for both developed and developing countries should include:Classification of motor abnormalities according to SCPE.Accompanying impairmentsFunctional classification levels for: gross motor/ambulatory function (GMFCS), manual abilities (MACS), communication, (CFCS) and eating and drinking ability (EDACS).This implies that only the first two components of the standardized classification proposed by Bax et al. [16] in 2011. The child on level II may need hand-held mobility device when first learning to walk (younger than 4 years) and eventually walks with limitations (after 6 years). 2009;23:164-170Submitted: March 14th, 2018 Reviewed: June 1st, 2018 Published: November 5th, 2018© 2018 The Author(s). The CFCS level identification chart is shown in Figure 5.The Communication Function Classification System (CFCS). Neuropsychopharmacology Reviews. Licensee IntechOpen. Hidecker MJC, Paneth N, Rosenbaum PL, Kent RD, Lillie J, Eulenberg JB, et al. International Classification of Impairment, Activity

and Participation. It is important to note that the child on GMFCS level III may be added to children on levels I and II (walking at least indoors) or to children on levels IV and V (wheeled mobility at least in the community). 2004;145:S3-S721. Using the functional classifications to guide management helps the pediatrician, the occupational therapist, the physiotherapist, the speech and language therapist and all involved in the care of children with CP to achieve this goal. This explains the clinical combination of motor/movement abnormalities, for example, spasticity and dystonia, and spasticity and choreoathetosis. Such classification systems based on multiple variables include the Swedish classification system [8], Edinburgh classification [9] and classification by the Surveillance for Cerebral Palsy in Europe (SCPE) [10].The current emphasis on the functional consequences of different health states increased interest and research on the functional classification of CP [1, 3, 4]. Philadelphia: Lippincott Williams & Wilkins; 1999. The purpose of linking these supplemental disorders to the physiological and topographic classifications was to identify syndromes with a common etiology that would lead to prevention [6, 20]. These classifications (groups) differ in the characteristic(s) used and their individual uses or purposes. Generally speaking, neuromotor findings in spastic CP are consistent and persistent while variability is the rule in extrapyramidal CP [6, 18, 19].The clinical features of spastic CP are as follows [6, 18, 19]:Tone is invariably increased (hypertonia), that is, persistently increased with little or no variation in the awake (movement, tension and emotion) or sleep states. Nevertheless, malformations are more likely to occur earlier in gestation, and thus, neuroimaging confirmation of their presence can help establish that the cause of CP is unrelated to perinatal events [27].Categorizing patients with CP based on neuroradiologic findings implies that neuroimaging studies be carried out on all patients. Rosenbaum P. The definition and classification of cerebral palsy: Are we any further ahead in 2006? Developmental Medicine and Child Neurology. Korzeniewski SJ, Birbeck G, Delano MC, Potchen MJ, Paneth N. A systematic review of neuroimaging for cerebral palsy. The manual ability classification system (MACS) for children with cerebral palsy: Scale development and evidence of validity and reliability. Hagberg B. Therefore, it will be difficult to apply such classification in resource-poor countries where neuroimaging facilities are not readily available or affordable and the professional expertise needed may be lacking. Therefore, the other classifications may suggest functional abilities in children with CP.AdvertisementThese are the Swedish classification [8], Edinburgh classification [9] and Surveillance for Cerebral Palsy in Europe (SCPE) classification [10].CP subtypes based on the Swedish classification (1989) [8] are spastic (hemiplegic, tetraplegic, and diplegic), dyskinetic (dystonic and athetotic), ataxic and unclassified/mixed. Strictly speaking, pyramidal lesions induce spasticity as a result of concomitant damage to extrapyramidal pathways [21]. The New England Journal of Medicine. DOI: 10.1017/s0012162200076325. Sellers D, Mandy A, Pennington L, Hankins M, Morris C. Development and reliability of a system to classify the eating and drinking ability of people with cerebral palsy. Hou M, Zhao JH, Yu R. Recent advances in dyskinetic cerebral palsy. 2006;7(11):e5693. Reproduced with permission.The MACS, developed in 2006 by Eliasson et al. Such a classification would be called holistic, comprehensive or standardized. This means that it was only in a few examples like bilirubin encephalopathy that such a link between supplemental disorders, physiology and etiological factor could be established. Currently, it is recommended that at least the presence/absence of epilepsy be recorded and intellectual function (IQ), vision and hearing be assessed [1].The categorization based on the actual cause (etiology) and timing of insult was aimed at prevention, and the association of erythroblastosis fetalis with choreoathetoid CP was the paradigm for this classification [6, 20]. The GMFCS—ER [32] is shown in Figure 2. Moreover, the accompanying impairments may cause more functional limitation than the primary motor dysfunction (the core feature of CP) and thus must be addressed to achieve a positive functional outcome. Thus, the EDACS ranges from independent ability to safely and efficiently eat and drink like peers on a wide range of textures (level I) to total dependence for eating and drinking and reliance on tube feeding (level V) [17]. It subdivides spastic CP into: quadriplegia (symmetric/equal and severe spasticity of all four limbs), diplegia (involvement of the four limbs but greater spasticity and weakness in the lower limbs) and hemiplegia (involvement of the upper and lower limbs on one side of the body) [19]. However, there is evidence that cell migrational disorders can occur in the last 2–3 months of pregnancy [27]. In: McMillan JA, DeAngelis CD, Feigin RD, Warshaw JB, editors. Therefore, a multiaxial classification gives a more comprehensive description of a child with CP. The result is an evolution of newer measures (functional scales) that objectively and reliably measure and quantify functional abilities. Nevertheless, GMFCS level III is usually classified as ambulatory because the child is independently mobile in some settings irrespective of the need for assistive mobility device. One notable source of confusion is distinguishing spastic diplegia from quadriplegia. Palisano R, Rosenbaum P, Walter S, Russell D, Wood E, Galuppi B. Development and reliability of a system to classify gross motor function in children with cerebral palsy. The classification tree of the SCPE for subtypes of CP is shown in Figure 1.Classification tree for sub types of CP by SCPE.Due to the lack of reliability of the terms used in Minear's topographic classification, SCPE [10] introduced two new terms to replace quadriplegia, diplegia, and hemiplegia. [1] in 2005 proposed a standardized CP classification scheme with four major components namely:Motor abnormalities (a. Shapiro BK, Capute AJ. Cerebral palsy. Gorter JW, Rosenbaum PL, Hanna SE, Palisano RJ, Bartlett DJ, Russell DJ, et al. It provides information that will allow evaluation of change at different points in time in the same patient such as after an intervention [1].However, it falls short of giving full descriptive information about a child with CP that clearly delineates the nature of the problem. This conceptual change introduced by the ICF is topical.The functional classifications are analogous and when used together complete the description of daily functional activities in CP at the activity or participation level of the ICF [3, 30]. [24] Many experts agree that the use of these terms in classification should be stopped [1]. Palisano RJ, Rosenbaum P, Bartlett D, Livingston MH. GMFCS—Expanded & Revised © 2007. 2005;47:571-576. Dystonia occurs when there is simultaneous contraction of both agonist and antagonist muscles. Thus, current classifications of CP are functional scales for various functions impaired in CP such as communication, gross motor, fine motor, and oromotor/oropharyngeal functions. Ataxic CP occurs when there are signs of incoordination and hypotonia caused by damage to the cerebellum. They are mainly used for predicting current and future management needs of children with CP, and their use agrees with current thinking in management of CP.Advances in management of CP including the biopsychosocial method of service delivery that recommends liberal use of assistive devices require additional characteristics or variables to be added to traditional classifications in order to assist management and satisfy other important purposes like clinical description and research [1, 4, 5]. That is, they are used like the GMFCS to guide functional intervention. 1991;33:241-24523. Thus, the MACS was adjusted in 2016 by Eliasson et al. 2004;46:461-467. DOI: 10.1111/j.1469-8749.2011.03996.x17. [14] and modeled on the GMFCS, has been shown by various studies to be valid and reliable. SCPE Collaborative Group: A collaboration of cerebral palsy surveys and registers. A recent study by Hou et al. 2009;20:425-425. The management of a child on GMFCS level V involves pervasive supports and a manual wheelchair for transportation in all settings (physical assistance at all times) [11].The MACS [14] and the mini-MACS [31] are five-level scales for classifying arm and hand function (manual abilities/manual dexterity) in children with CP aged 4–18 years and 1–4 years, respectively. In addition, dyskinetic CP points to damage to the basal nuclei by bilirubin encephalopathy and severe perinatal asphyxia at term [19]. Singapore: McGraw-Hill; 2005. The adjustments were simply to obtain descriptions that are applicable to children less than 4 years of age. The CFCS by classifying communication effectiveness in CP is useful in service delivery. Pakula AT, Braun KVN, Yeargin-Allsopp M. Cerebral palsy: Classification and epidemiology. Parents/caregivers want their children to receive treatments that will improve their condition, so any classification that is implicative of treatment is important to the patients and their caregivers and relevant to clinical practice. [33] reported lower inter-rater reliability of the MACS when used in children aged 1–5 years (linear weighted Kappa (k) of 0.67 and 0.55 for 2–5 years and 2 years, respectively). Limb distribution, type of motor disorders and functional classification of cerebral palsy: How do they relate? Linda Chigozie Ogoke for all her support during the period of writing up of this book chapter.1. Bax M, Goldstein M, Rosenbaum P, Paneth N. Proposed definition and classification of cerebral palsy. 1997;39:214-223. These concepts are contained in the ICF [3]. 20th ed. Clinical Rehabilitation. Nelson Textbook of Pediatrics. This is compounded by the fact that most of these factors are prenatal in timing. In addition to multidisciplinary care, the child on GMFCS level IV requires initially a body support walker that supports the pelvis and trunk for floor and chair sitting and later powered mobility and a manual wheelchair for transportation outdoors, at school, and in the community. Access through your institution rights and content The classification of cerebral palsy (CP) remains a challenge; hence the presence of so many classifications and a lack of consensus. Additionally, the physiological classification does not aid therapy or inform management of patients with CP, and this inability to indicate functional abilities remains a major drawback [6, 18, 20].This classification relies on the localization/limb distribution of neuromotor impairment in spastic CP [19]. This implies that children with CP differ clinically in many aspects. This implies that it describes both use of normal verbal and non-verbal communication (speech, gestures, behaviors, eye gaze, and facial expressions) and use of augmentative and alternative communication systems (AACs) (manual sign, pictures, communication books, communication boards and talking devices such as speech generating devices and voice output communication aids) [16]. The first version of GMFCS was published in 1997 by Palisano et al. pp. 2896-290920. However, extrapyramidal or dyskinetic CP is further subdivided based on the different manifestations of abnormal/involuntary movements (dyskinesia) and tone. This is the commonest type of extrapyramidal CP. Dystonic CP is characterized by extrapyramidal hypertonia and decreased movement (hypokinesia). Currently, it must include the functional scales so as to guide management.The neuropathologic classification is being awaited, and due to its contribution to the assessment of etiological factors and timing of insults in CP, it is critical to the development of a holistic or standardized classification of CP.AdvertisementI am grateful to Professor Sylvester O. Iloeje for his assistance and extend my thanks to all staff of Mother Healthcare Diagnostics & Hospital, 5B Okigwe Road, Owerri and department of Paediatrics, Federal Medical Centre, Owerri. Its major advantageYes. Besides, it does not indicate supplemental disorders that are necessary for assessing the service delivery needs of patients with CP.Iloeje and Ogoke [29] in 2017 reported that the type of CP (physiology and topography), etiological factors and the number of accompanying impairments (supplemental disorders) were positively associated with the severity of gross motor dysfunction and walking ability of children with CP. In that study [29], children with spastic quadriplegic type, bacterial meningitis as etiological factor or many (five or six) accompanying impairments all had severe gross motor dysfunction and were non-ambulatory. 2017;11(3):112-116. Thus, the neuropathologic classification relies on neuroimaging studies such as magnetic resonance imaging (MRI) and computed tomography scan (CT scan).Neuroimaging contributes significantly to the understanding of the etiology and pathology of CP and the timing of insults [1, 6, 20]. However, the descriptive terms in the topographic classification cannot be used reliably [6, 20]. (2014)Two ordinal scales (one 5-level, one 3-level)Comparison of current (functional) classifications.AdvertisementThe development of a standardized or holistic classification of CP is topical and in tandem with advances in understanding of CP, imaging techniques and quantitative motor assessments [1]. 2004;2(1):5-10. [32] to include an age group for youths 12–18 years. The EDACS algorithm is shown in Figure 6.Eating and Drinking Ability Classification System (EDACS) algorithm. There are functional scales for a number of functions impaired in CP. It is widely accepted that the functional classification remains the best classification for a patient with CP because it guides management [1, 5, 6].AdvertisementSome factors that influence the clinical classification of CP are the age of a child, reliability of the medical history, and extent of diagnostic investigations [1]. It helps identify those that will require augmentative and alternative communication systems to improve their communication. Ingram TTS. The neurology of cerebral palsy. Nelson KB, Ellenberg JH. Antecedents of cerebral palsy: Multivariate analysis of risks. South African Journal of Child Health. DOI: 1016/j.pmr.2009.06.0017. However, a study in 2009 by Plasschaert et al. 2006;1:23-2829. British Medical Journal. In: Review of Medical Physiology. The mini-MACS differs from the MACS due to the need for assistance in handling objects in children 1–4 years and the nature of the objects they are expected to handle.The MACS is used to ascertain the child's needs and inform management decisions such as choosing an appropriate upper limb intervention. Reproduced with permission [16].The EDACS was developed by Sellers et al. Pediatrics. 2017;4(30):1-1031. The subtypes are choreathetoid CP—characterized by excessive and rapid movements involving the proximal body parts (trunk) (chorea) combined with slow writhing movements of the distal parts of the body (extremities) (athetosis) and usually with reduced tone. These terms are bilateral and unilateral used to describe involvement of both sides and one side of the body, respectively. Rosenbaum P, Stewart D. The WHO international classification of functioning, disability and health: A model to guide clinical thinking, practice and research in the field of cerebral palsy. A major goal in the management of CP is to ambulate the children and enable independent living; this gave birth to the changing concepts and the GMFCS. So, how GMFCS is a useful guide to providing care appropriate for the functional level and age of a child with CP?A child on GMFCS level I will walk independently and so requires no adaptive mobility equipment but appropriate stimulation.