DIAGNOSIS: CEREBRAL PALSY

Cerebral Palsy is defined as**:** "a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behaviour, by epilepsy, and by secondary musculoskeletal problems".[1(p. 9)]

Cerebral palsy is not defined by the underlying etiology of the condition. All non-progressive disturbances of the fetal or infant brain occurring in the pre-natal, peri-natal and post-natal period, up to the age of 2 years, can lead to cerebral palsy. For example, children with a genetic anomaly, a chromosomal abnormality, a metabolic condition, or an acquired brain injury resulting from meningitis, encephalitis, or a stroke in early life can also be diagnosed with cerebral palsy if they have the motor findings described in the above definition.

Children who have not received a diagnosis of cerebral palsy may still be enrolled in the Hip Surveillance Program. A diagnosis of CP may not be provided while investigations are being completed to determine the underlying cause of a child's condition. It is the motor impairment, consistent with the definition of cerebral palsy, which is most important.

Disorders of the spinal nerves (i.e. spina bifida), peripheral nerves (i.e. spinal muscular atrophy), muscles (i.e. muscular dystrophy), or mechanical origins (i.e. arthrogryposis) are not cerebral palsy. Children with these conditions are not appropriate for hip surveillance.

Step 1: CLASSIFY

1. Gross Motor Function Classification System

Classify the child by Gross Motor Function Classification System (GMFCS) level.[2]

- GMFCS levels are used for children with CP to describe a child's self-initiated movement, with emphasis on sitting, transfers, and mobility.
- Determining a child's GMFCS level requires familiarity with the child and their usual performance of motor skills but no formal assessor training is required. It can be completed in only a few minutes.
- User instructions for the GMFCS - Expanded and Revised (GMFCS – E & R) are available for free download at https://www.canchild.ca/system/tenon/assets/attachments/000/000/058/original/GMFCS-ER_English.pdf.

2. Manual Ability Classification System

Classify the child by Manual Ability Classification System (MACS) or Mini-MACS level.[3]

- MACS levels are used to describe how a child a CP uses their hands to handle objects in daily activities.
- Determining a child's MACS level requires familiarity with the child and their usual performance of manual abilities.
- The MACS was developed for children aged 4 -18 years of age; the Mini-MACS is for children aged 1- 4 years.
- User instructions and a flow chart can be used together to determine which MACS level best describes a child's manual ability. These are available for free download at: http://www.macs.nu/.

3. Communication Function Classification System

Classify the child by Communication Function Classification System level.[4]

- CFCS levels are used to describe the everyday communication of a child a CP.
- Determining a child's CFCS level requires familiarity with the child's communication in everyday situation, including both sending and receiving of information.
- User instructions for the CFCS are available for free download at: www. http://cfcs.us/.

4. Motor Distribution

Bilateral**:** involvement of both sides of the body

Unilateral (Hemiplegia): involvement of one side of the body, including involvement of only one extremity

5. Hemiplegic Gait

If unilateral, determine if the child has a Type IV Hemiplegic gait pattern. Winters, Gage and Hicks (WGH) (1987) described the classification of hemiplegic gait into four gait patterns.

Type IV hemiplegic gait (Figure 4) involves more marked proximal involvement with:

- hip flexion,
- hip adduction,
- hip internal rotation, and
- pelvic retraction[5,6].

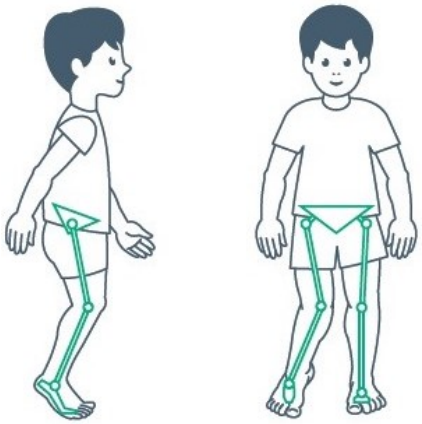

Figure 1: Type IV Gait includes hip flexion, hip adduction, hip internal rotation, and pelvic rotation.

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6. Motor Type

Spasticity**:** increased muscle tone with one or both of the following: "1) resistance to externally imposed movement increases with increasing speed of stretch and varies with the direction of joint movement; 2) resistance to externally imposed movement rises rapidly above a threshold speed or joint angle"[7,pe91]

Dystonia: "a movement disorder in which involuntary sustained or intermittent muscle contractions cause twisting and repetitive movements, abnormal postures, or both" [7,p.e92, 6]

Chorea: "an ongoing random-appearing sequence of one or more discrete involuntary movements or movement fragments"[8, p.1542]

Athetosis: "a slow, continuous, involuntary writhing movement that prevents maintenance of a stable posture" [8, p.1542]

Ataxia: an "inability to generate a normal or expected voluntary movement trajectory that cannot be attributed to weakness or involuntary muscle activity about the affected joints"[9, p2162]

Hypotonic: decreased resistance to passive stretch at rest[10]

An online learning module describing the classification and assessment of movement disorders in children is available on the PHSA Learning Hub at: https://learninghub.phsa.ca/Courses/4968/movement-disorders-in-children.

Step 2: ASSESS

Please document the clinical measures as completely as possible. Completing this clinical exam can be challenging, particularly with school aged youth due to the size of the child/youth and space restrictions. It may help to have the child's parent or assistant provide extra support while you measure. If space is an issue, consider using school changing tables. If you are unable to complete a test, please check the "not tested" box and provide a comment indicating the reason. Inability to complete these measures should not prevent enrolling a child in the program.

1. Hip Abduction Range of Motion[11]

Start Position:

- Position the child supine with the pelvis level; legs are in the anatomical position; hips should be at 0° flexion and the knees fully extended
- If the child has a hip or knee flexion contracture, complete the measure position with the child as close to the desired position as possible

Goniometer Placement:

- The axis is placed over the ASIS on the side being measured.
- The stationary arm is between the two ASISs.
- The movable arm is parallel to the longitudinal axis of the femur.
- In the start position, the goniometer will read 90^{o}. This is recorded as 0^{o}.

End Position[12]:

- The hip is abducted to the limit of motion with the knee in extension. Ensure the pelvis does not move.
- Complete the movement slowly to get full passive range and record as the value.

2. Pain

While completing hip abduction range of motion (ROM) measurements, assess for the presence of hip pain.

Videos showing how to complete this measurement are available as part of the Child Health BC Hip Surveillance Program **e-learning module,** available on the program website: www.childhealthbc.ca/hips.

Step 3: Ask

Information from the child or youth and their family or caregivers is an important part of hip surveillance. Have the child and/or the child's caregiver consider the last 6 months or the time period since their last clinical exam. Ask the following question related to the hip:

1) Do [does] you [your child] have hip pain? You may notice this when you move [your child moves] your [their] hip or after prolonged activity, when changing your [your child's] position, when you move you [your child's] leg or when looking after your [your child's] personal care.

REFERENCES

1. Rosenbaum P, Paneth N, Leviton A, Goldstein M, & Bax M. A report: the definition and classification of cerebral palsy April 2006. *Dev Med Child Neurol.* 2007; 49(S109): 8-14.
2. 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. Dev Med Child Neurol. 1997:39:214-223.
3. Eliasson AC, Krumlinde Sundholm L, Rösblad B, Beckung E, Arner M, Öhrvall AM , Rosenbaum P. The Manual Ability Classification System (MACS) for children with cerebral palsy: scale development and evidence of validity and reliability Developmental Medicine and Child Neurology 2006 48:549-554.
4. Hidecker, M.J.C., Paneth, N., Rosenbaum, P.L., Kent, R.D., Lillie, J., Eulenberg, J.B., Chester, K., Johnson, B., Michalsen, L., Evatt, M., & Taylor, K. (2011). Developing and validating the Communication Function Classification System (CFCS) for individuals with cerebral palsy, Developmental Medicine and Child Neurology. 53(8), 704-710. doi: 10.1111/j.1469-8749.2011.03996.x, PMC3130799.
5. Winters T, Gage J, & Hicks R. Gait patterns in spastic hemiplegia in children and adults. *J Bone Joint Surg [Am]*, 1987;*69:* 437 – 441.
6. Rodda, J & Graham, HK. Classification of gait patterns in spastic hemiplegia and spastic diplegia: a basis for a management algorithm. *Eur J Child Neurol,* 2001; 8 (Suppl. 5): 98-108.
7. Sanger TD, Delgado MR, Gaebler-Spira D, Hallett M, Mink J, & Task Force on Childhood Motor Disorders. Classification and Definition of Disorders Causing Hypertonia in Childhood. *Pediatrics*. 2003; 111: e89–e97.
8. Sanger TD, Chen D, Fehlings DL, Hallett M, Lang AE, Mink JW, et al. Definition and classification of hyperkinetic movements in childhood. *Mov Disord*. 2010; 25(11): 1538-1549.
9. Sanger TD, Chen D, Delgado MR, Gaebler-Spira D, Hallett M, Wink JW, & Task Force on Childhood Motor Disorders. Definition and classification of negative motor signs in childhood. *Pediatrics*. 2006; 118(5): 2159-2167.
10. Sanger TD. Pathophysiology of Pediatric Movement Disorders. *J Child Neurol*. 2003; 18 (suppl1): S9-S24.
11. Clarkson, HM. Musculoskeletal assessment. Joint range of motion and manual muscle strength. 2nd Edition. 2000. Baltimore, MD: Lippincott Williams & Wilkins.
12. Boyd RN, & Graham HK. Objective measurement of clinical findings in the use of botulinum toxin type A for the management of children with cerebral palsy*. Eur J of Neurol,* 1999; 6 (suppl 4): S23-S35.