CHILD HEALTH BC

HIP SURVEILLANCE PROGRAM

for Children with Cerebral Palsy

British Columbia's Consensus on Hip Surveillance for Children with Cerebral Palsy

Information for Health Care Professionals
Caring for Children with Cerebral Palsy

2018

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SUMMARY

British Columbia's Consensus on Hip Surveillance for Children with Cerebral Palsy was originally established by a group of over 60 multidisciplinary professionals and parents from all regions of the province. Meetings were held in May 2011 and January 2012. Attendees established consensus regarding the desire to create a British Columbia (BC) hip surveillance program for children with CP and reached consensus on the commencement, frequency, and discharge criteria for surveillance. In 2017, BC's Consensus was updated to reflect international consensus achieved in the development of the American Academy of Cerebral Palsy and Developmental Medicine (AACPDM) Hip Surveillance Care Pathway.[1] Experts participating in this consensus were from Canada, Australia, Scotland and the United States. This booklet describes the established consensus.

AUTHORS OF THIS REPORT:

Stacey Miller, Physiotherapist, BC Children's Hospital
Kishore Mulpuri, Pediatric Orthopaedic Surgeon, BC Children's Hospital
Maureen O'Donnell, Developmental Pediatrician & Executive Director, Child Health BC

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British Columbia's Consensus on Hip Surveillance for Children with Cerebral Palsy

INTRODUCTION AND OBJECTIVE

Hip surveillance is the process of identifying and monitoring critical early indicators of progressive hip displacement.[2] Hip displacement, or subluxation, is the gradual movement of the femoral head laterally from under the acetabulum. A hip is dislocated when the femoral head is completely displaced from under the acetabulum.

Children with cerebral palsy (CP) are at risk for hip displacement. The objective of BC's Consensus is to outline recommendations for hip surveillance to ensure that children with CP receive appropriate screening and are referred to a pediatric orthopaedic surgeon at the appropriate time to minimize or prevent complications associated with hip dislocations. Hip displacement is often silent, with no physical signs or symptoms. Left untreated, displaced or dislocated hips may cause pain, decreased hip range of motion, decreased sitting, standing, or walking tolerance, and difficulty with personal care. Timely orthopaedic management is critical to those children identified through surveillance as having progressive displacement. This document does not address the orthopaedic management of progressive hip displacement. The intervention should be tailored to the needs of the individual child.

Surveillance practices in Australia and Sweden[2,3], best available research evidence, and expert opinion were used to establish the 2012 Consensus. In 2017, the BC Consensus was updated to reflect international consensus established during the creation of the American Academy of Cerebral Palsy and Developmental Medicine (AACPDM) Hip Surveillance Care Pathway.[1] Experts participating in this consensus were from Canada, Australia, Scotland and the United States. Differences between BC's Consensus and the AACPDM Care Pathway for children at GMFCS level I and II and those with a Group IV hemiplegic gait pattern are a result of how services are provided to children in British Columbia and the age of school entry.

This document was created for health care professionals caring for children at risk for hip displacement.

EVIDENCE FOR HIP SURVEILLANCE

Early identification of hip displacement through surveillance has been demonstrated to be an effective means of reducing the incidence of hip dislocation in children with CP. A systematic review on the evidence for hip surveillance found surveillance is an effective means of identifying hip displacement.[4] Hip surveillance programs, in combination with timely orthopaedic management, have been shown to decrease or prevent the incidence of hip dislocations in children with CP.[5-8]

INCLUSION

All children with CP should be included in a hip surveillance program. CP 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".[9(p. 9)]

CP is not defined by the underlying cause 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 CP. 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 CP if they have the motor findings described in the above definition. In these children, we simply understand why they have CP.

Children not yet diagnosed with CP, but for whom there is a clinical suspicion of having CP, should receive hip surveillance. Investigations to determine the underlying cause of a child's motor impairment should not prevent or slow the initiation of hip surveillance.

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 considered CP and, therefore, this Consensus is not applicable.

HIP DISPLACEMENT

The hip is a ball and socket joint, with the acetabulum making up the 'socket' and the femoral head making up the 'ball' (Figure 1a). In a healthy hip the femoral head rests completely in the acetabulum. Hip displacement, also called subluxation, refers to the gradual movement of the femoral head laterally from under the acetabulum (Figure 1b). A hip is dislocated when the femoral head is completely displaced from under the acetabulum (Figure 1c). Delayed or absent weight bearing, limitations in gross motor function, and abnormal muscle forces around the hip joint may affect the development of the proximal femur and hip joint.

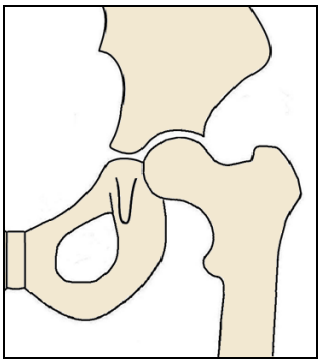

Figure 1a: Normal Hip

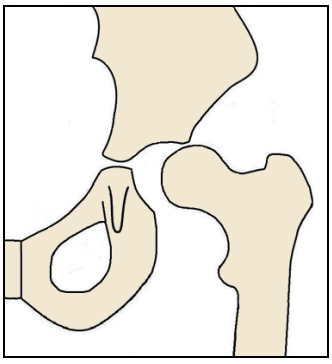

Figure 1b: Displaced Hip

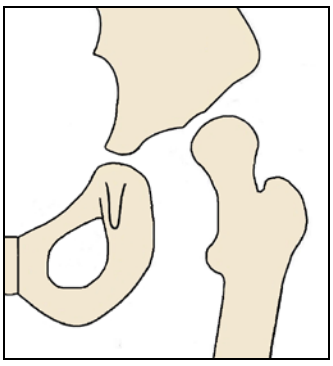

Figure 1c: Dislocated Hip

LEVEL OF RISK

Hip displacement is the second most common deformity in children with CP.[10] The overall incidence of hip displacement in children with CP has been found to be approximately one-third (26-35%).[3,11-13]

Motor Function

Hip displacement has been shown to be directly related to a child's gross motor function, as described by the child's Gross Motor Function Classification System (GMFCS) level, and is, therefore, used as a basis for this Consensus Statement (Figure 2).[3,11-13]

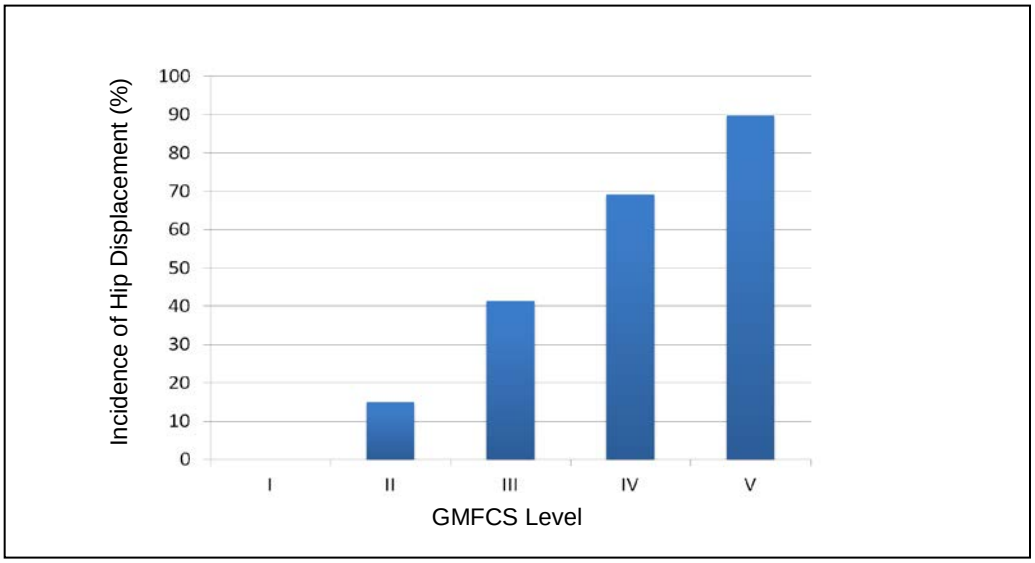

Figure 2: Incidence of hip displacement (Migration Percentage >30%) by GMFCS Level[11]

The GMFCS is a five level classification system for children with CP that is based on self initiated movement.[14,15] It was originally created in 1997 and was expanded and revised in 2007.[14,15] The GMFCS-Expanded & Revised is available for download, free of charge, at https://www.canchild.ca/system/tenon/assets/attachments/000/000/058/original/GMFCS-ER_English.pdf.

Classifying a child's GMFCS level requires familiarity with the child and their usual performance of motor skills but no formal training is required. It can be completed in only a few minutes. Distinctions between levels are based on functional limitations, the need for hand held mobility devices or wheeled mobility, and, to a lesser extent, quality of movement. Each level has been given a title that reflects the method of mobility typical for children at that level after 6 years of age:

GMFCS I: Walks without Limitations
GMFCS II: Walks with Limitations
GMFCS III: Walks Using a Hand-Held Mobility Device
GMFCS IV: Self-Mobility with Limitations; May Use Powered Mobility
GMFCS V: Transported in a Manual Wheelchair

Separate age bands exist as classification of motor function is dependent upon age. These age bands include:

- before 2nd birthday,
- between 2nd and 4th birthday,
- between 4th and 6th birthday,
- between 6th and 12th birthday, and
- between 12th and 18th birthday.

Children under the age of 2, if born premature, should be classified based on their corrected age. Expectations for gross motor function differ by age so it is important to consult the User Instructions each time a child's motor function is classified.

Gait Pattern

Most children with hemiplegia are classified at GMFCS level I or II. As such, they are at low risk for hip displacement and discharged from surveillance prior to skeletal maturity. However, children with a Winters, Gage, and Hicks (WGH) Group IV hemiplegic gait must be followed until skeletal maturity (from now on referred to as Group IV gait).

Winters, Gage and Hicks[16] described the classification of hemiplegic gait into four gait patterns (Figure 3).[17] Group IV gait involves more marked proximal involvement of the hip. The WGH classification system is only based on changes in the sagittal plane but many children with hemiplegia also have deviations in the coronal and transverse plane. It is these children who have changes in all three planes of motion that should be included in hip surveillance. For the purposes of hip surveillance, Group IV gait pattern is characterized by:

- a flexed hip and an anterior pelvic tilt (sagittal plane),
- an adducted hip (coronal plane), and
- hip internal rotation (transverse plane).[16,17]

Children with this gait pattern are at risk of progressive hip displacement that typically occurs later than children with bilateral CP.[2] Risk of hip displacement in children with bilateral CP is not related to their gait pattern. Their level of risk is determined by GMFCS level only.

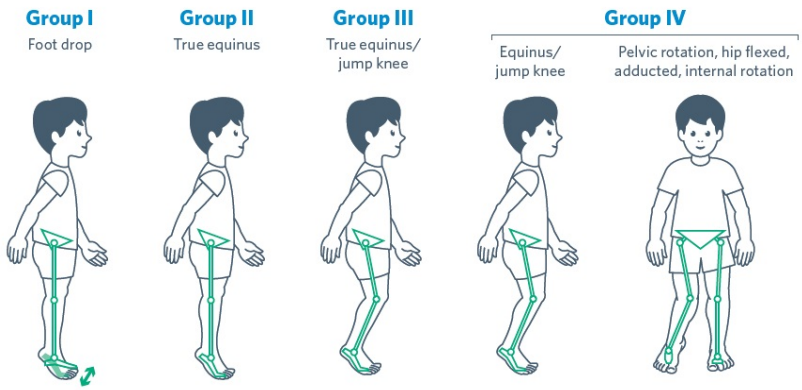

Figure 3: Group IV Hemiplegic Gait Patterns.[16, 17]
Illustration reproduced with permission and copyright © Bill Reid, The Royal Children's Hospital, Melbourne, AUS.

ASSESSMENTS

Hip surveillance requires both clinical and radiological review. Clinical examination is an important component of hip surveillance but hip displacement cannot be based on clinical assessment alone.[5,18]

The frequency of the clinical and radiological examinations is dependent upon a child's risk for hip displacement and is, therefore, determined by the child's GMFCS level and, for children with hemiplegia, the child's gait pattern. The recommended frequency of clinical and radiological examinations is illustrated in the Quick Guide on page 9.

Clinical Examination[a]

This Clinical Exam is solely for the purpose of hip surveillance and is to be completed by the child's physiotherapist. If a child does not have a physiotherapist, it is to be completed by a designated health care professional familiar with the assessments.

Before completing the clinical exam, please see the Clinical Exam Instructions and e-learning module that are available at www.childhealthbc.ca/hips for more information on how to complete the measures involved.

***Step 1: Classify**:*

- Determine GMFCS level
- Identify Group IV hemiplegic gait pattern (in children with hemiplegia)

***Step 2: Assess**:*

- Hip abduction range of motion measured with hips at 0° flexion and knees fully extended
- Pain during clinical examination

***Step 3: Ask** the Child's Parent or Primary Caregiver:*

- 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 your [your child's] leg or when looking after your [your child's] personal care.[1]
- Who is your family physician/pediatrician?

Radiological Assessment

The radiological measure used to monitor hip displacement is migration percentage (MP). MP is defined as the percentage of the ossified femoral head outside of the lateral margin of the ossified acetabulum (Figure 4).[19] Reimers reported that the 90th percentile for MP in typically developing children at 4 years of age was 10%.[19] A hip is considered 'at risk' when the MP is greater than 30%. Evidence supports measurement of MP by a single, experienced examiner.[22,23]

[a] The Clinical Exam component of the Consensus Statement does not replace the need for regular, comprehensive musculoskeletal assessment as a component of overall management.

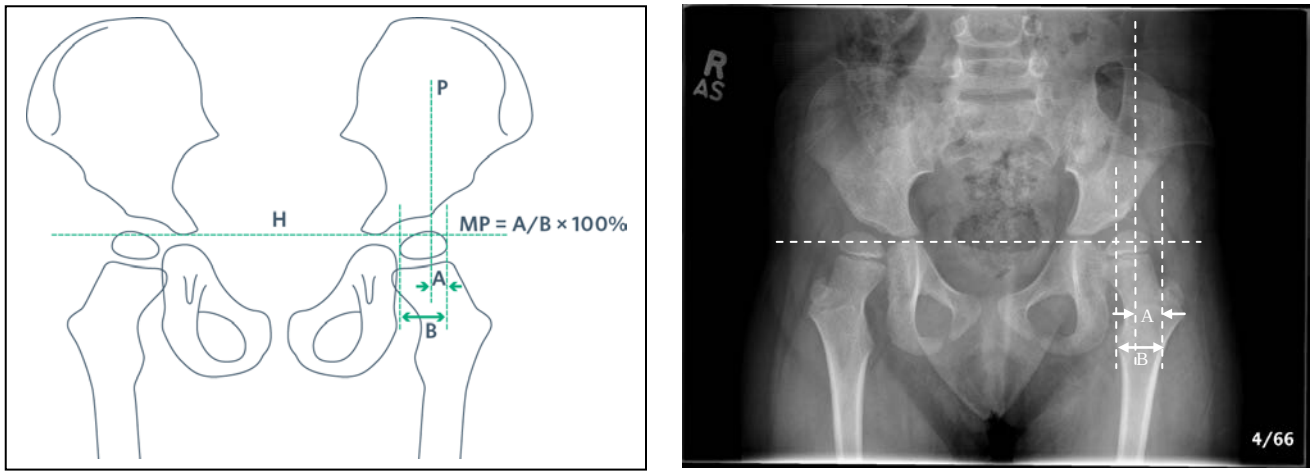

Figure 4: Measurement of Migration Percentage[5].
Illustration reproduced with permission from Wynter M et al. Australian Hip Surveillance Guidelines for Children with CP 2014.[24]

An antero-posterior (AP) radiograph of the pelvis taken in a standardized position is required to accurately measure the migration percentage (Figure 5).[19-21] MP is affected by the amount of abduction or adduction of the leg so the leg should be positioned in neutral. Measurement of the MP requires that the triradiate cartilages be visible and therefore anterior and posterior pelvic tilt must be corrected.

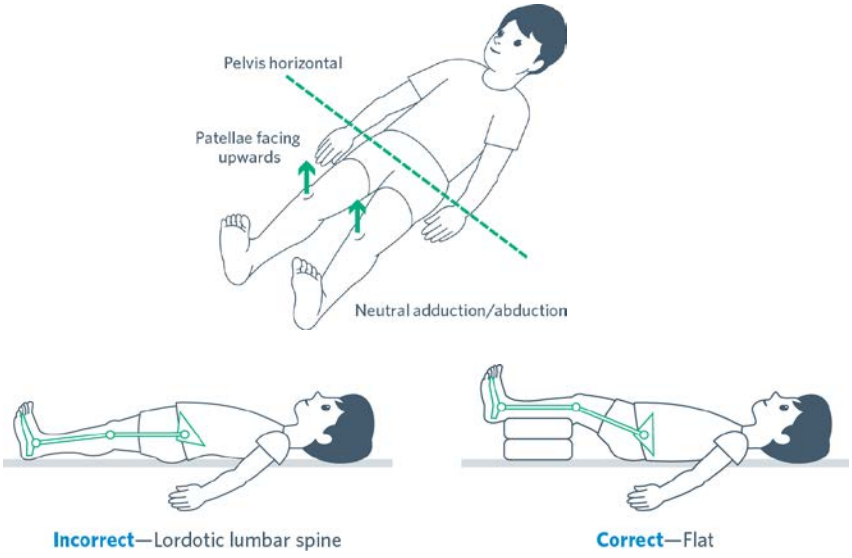

Figure 5: Standardized positioning for antero-posterior radiograph.
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RECOMMENDED FREQUENCY OF HIP SURVEILLANCE

Surveillance frequency is based on a child's age, GMFCS level, and, for children with hemiplegia, gait type. Surveillance is ideally initiated by 2 years of age, when a CP diagnosis is provided, or when CP is suspected.[1] Enrollment in hip surveillance may occur prior to age 2 years for children who are diagnosed or suspected of having CP at a young age; radiographs may not be recommended until age 2 years.

Surveillance frequency increases with increasing GMFCS level. Frequency may be reduced when the migration percentage is less than 30% and has remained stable over a period of 2 years. Stability is defined as < 10% change in MP over a 12 month period.

The frequency of clinical exams and radiographs is shown in the Quick Guide on page 8.

REFERRAL TO ORTHOPAEDIC SURGEON

The intention of BC's Consensus on Hip Surveillance is that review by a pediatric orthopaedic surgeon occurs at the appropriate time. A referral to an orthopaedic surgeon should occur in the following situations:

- Migration Percentage > 30%
- End of range hip abduction < 30˚ when measured with hips at 0° flexion and knees extended
- Presence of pain on clinical exam
- Positive answer to the pain question in the Clinical Exam
- Any other clinical concern that is felt to be related to the hip

An aim of hip surveillance is that orthopaedic review occurs at the appropriate time when treatment options are available. Every child referred to orthopaedic services should be managed with an individualized management plan, which may or may not include ongoing hip surveillance.[2] Children who have surgery for hip displacement or dislocation should return to surveillance post operatively until reaching skeletal maturity.

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British Columbia's Consensus on Hip Surveillance for Children with Cerebral Palsy QUICK GUIDE[1, 2]

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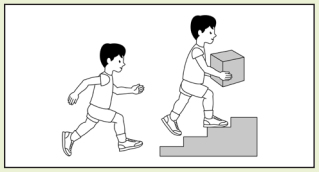
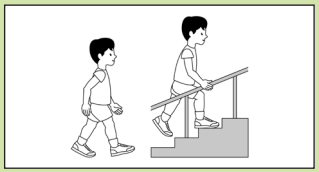
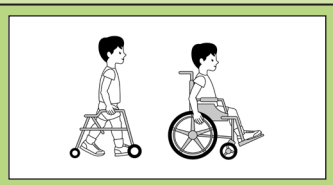
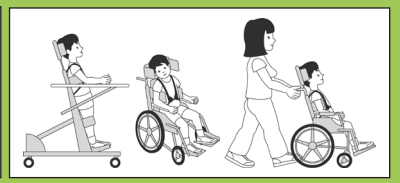
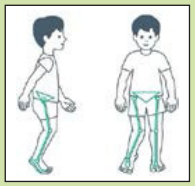
Classification[3,4]	ID or 2	Age in Years: 2.5	3	3.5	4	5	6	7	8	9	10	Continue Until Bones Stop Growing (on X-ray)
 GMFCS I*												
 GMFCS II*												
 GMFCS III#												 Every 2 years Every 2 years
 GMFCS IV#  GMFCS V#												 Every year Every year
 Any GMFCS with Group IV Hemiplegic Gait*5-7												 Every 2 years Every 2 years

Legend: GMFCS: Gross Motor Function Classification System[2]
ID: Identification/Diagnosis of cerebral palsy
Group IV Hemiplegic Gait: Child walks with one hip turned and pulled inward[5,6]
 Clinical Exam  X-Ray
*Altered from AACPDM Care Pathway due to age of school entry
#Do not reduce frequency of exam if migration percentage unstable or over 30%

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7. Illustration reproduced with permission and copyright © Bill Reid, The Royal Children's Hospital, Melbourne, Australia.

HIP SURVEILLANCE DISCHARGE CRITERIA

Hip displacement can occur during the pubertal growth spurt and thus children at risk must be followed until skeletal maturity.[11] The closure of the triradiate cartilage on the AP radiograph is used as the prime indicator of skeletal maturity.[2]

Children whose motor function is classified at GMFCS levels I & II, excluding those with a Group IV gait pattern, are at low risk for hip displacement, and are followed until the age of 5 and 10 years, respectively.

For children at GMFCS levels III, IV, and V, who have pelvic obliquity associated with clinical or radiographic evidence of increasing scoliosis, hip surveillance should ideally be continued beyond skeletal maturity as their hips continue to be at risk.[1]

HOW TO USE THIS CONSENSUS STATEMENT

This Consensus is for use by individuals caring for children with CP, within the Child Health BC Hip Surveillance Program. It is intended for education and to assist in clinical decision making. **Individual clinicians are to use their own clinical judgment in decision making about individual clients.** Should you have questions, contact the child's physician or orthopaedic surgeon.

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Appendix A

ABBREVIATIONS

AP	antero-posterior
BC	British Columbia
CP	cerebral palsy
GMFCS	Gross Motor Function Classification System
MP	migration percentage
WGH	Winter, Gage, and Hicks

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For more information on the Child Health BC Hip Surveillance Program, visit www.childhealthbc.ca/hips.

To speak with the Hip Surveillance Coordinator, call 604-875-2345 or 1-888-300-3088, extension 4099, or email hips@cw.bc.ca.

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