ONTARIO
PHYSIOTHERAPY
ASSOCIATION

February 22, 2016

HIP DISPLACEMENT AND SURVEILLANCE FOR CHILDREN WITH CEREBRAL PALSY

Ontario Paediatric Hip Surveillance Working Group

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HIP SURVEILLANCE PROGRAM
for Children with Cerebral Palsy

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Children's TREATMENT CENTRE OF CHATHAM-KENT

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Five Counties CHILDREN'S CENTRE

Closing the Gap HEALTHCARE GROUP

Holland Bloorview Kids Rehabilitation Hospital

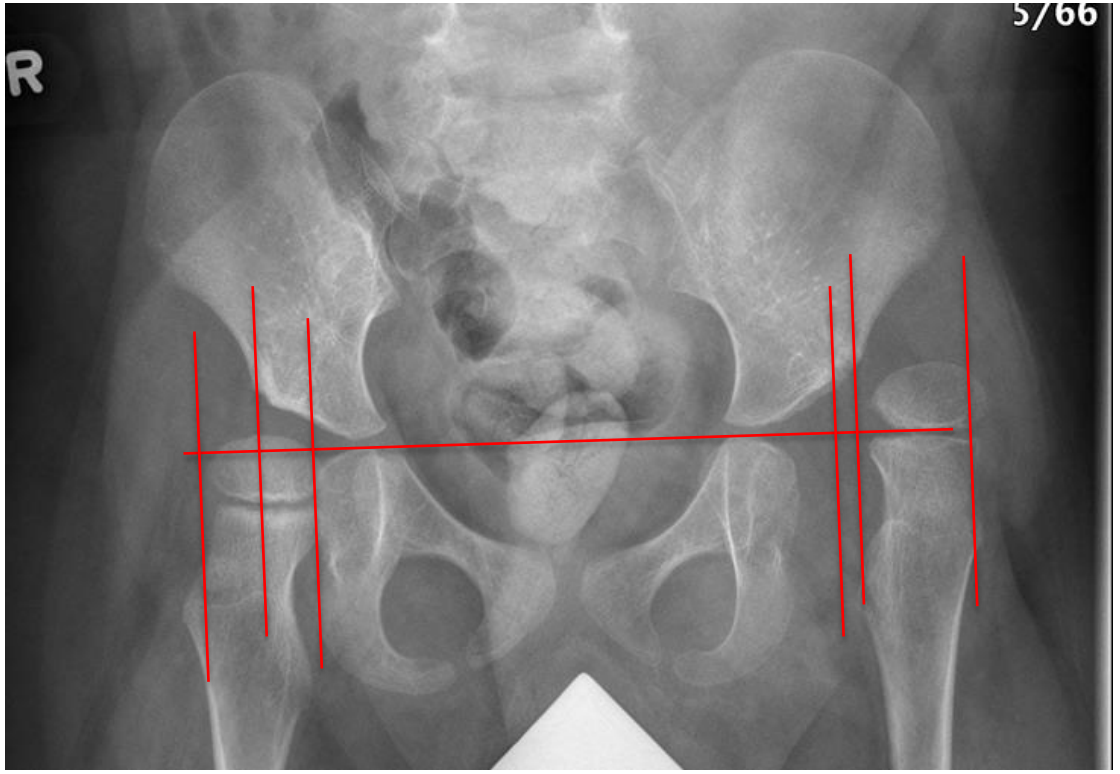
McMaster Children's Hospital

PLAN OF ATTACK:

- Review pathophysiology and consequences of hip displacement for children with cerebral palsy (CP)
- Identify risk factors for hip displacement
- Review the current evidence for hip surveillance and identify critical components of a hip surveillance program
- Introduce the current work being done around the world, and in Ontario.

HIP DISPLACEMENT

Normal hip alignment



Hip Displacment and Dislocation

Content Contributed by Child Health BC Hip Surveillance Program

INCIDENCE OF HIP DISPLACEMENT

2nd Most common orthopaedic deformity in children with cerebral palsy

(Cornell, 1995)

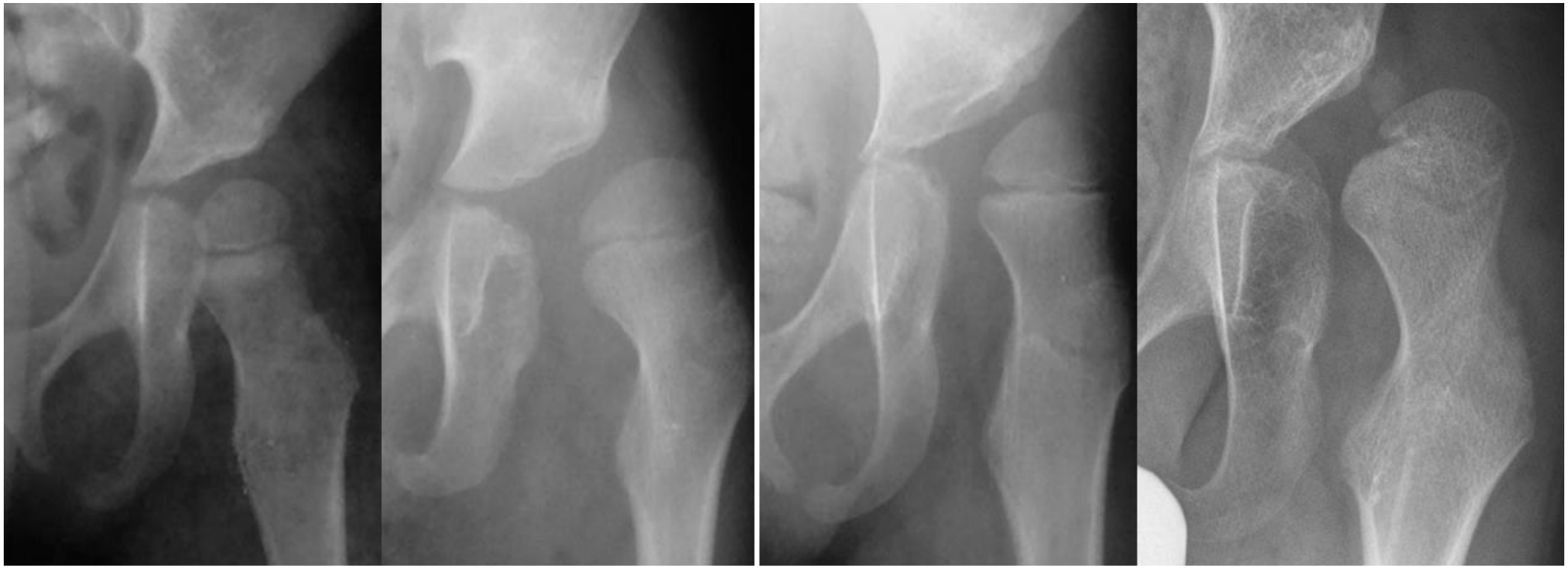
1 in 3 children with CP have hip displacement

(Hagglund et al., 2007; Kentish et al., 2011; Soo et al., 2006; Terjesen, 2012)

Up to 90% in GMFCS V

Content Contributed by Child Health BC Hip Surveillance Program

NATURAL HISTORY



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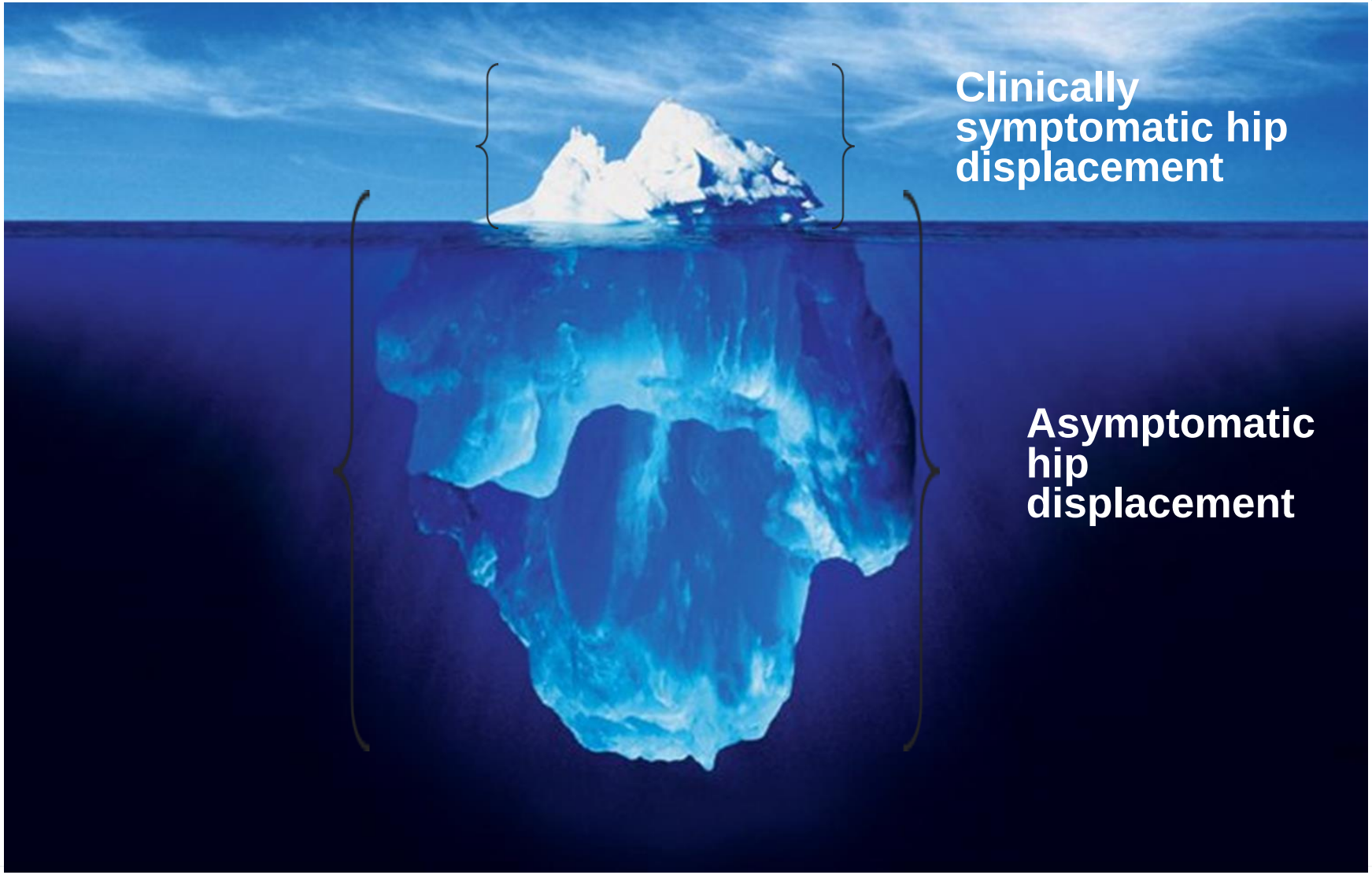
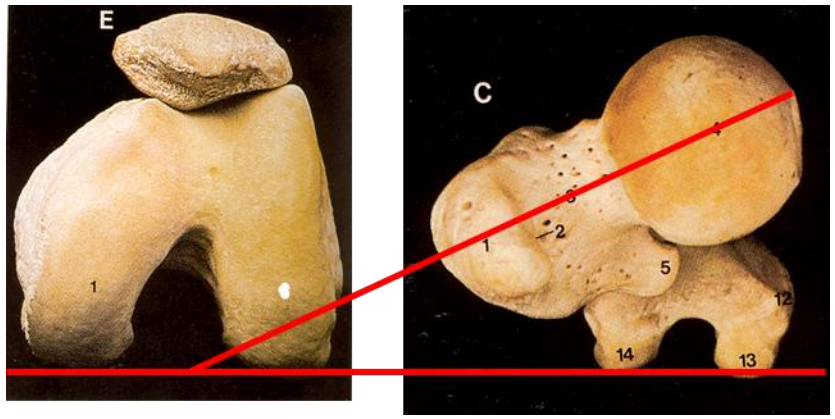
THE PROBLEM


Clinically symptomatic hip displacement
Asymptomatic hip displacement

CAUSE OF HIP DISPLACEMENT



- Delayed/reduced weight-bearing and abnormal muscle forces around the hip
- Changes in the proximal femur
  - Increased femoral anteverison
  - Increased femoral neck-shaft angle

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MYTH

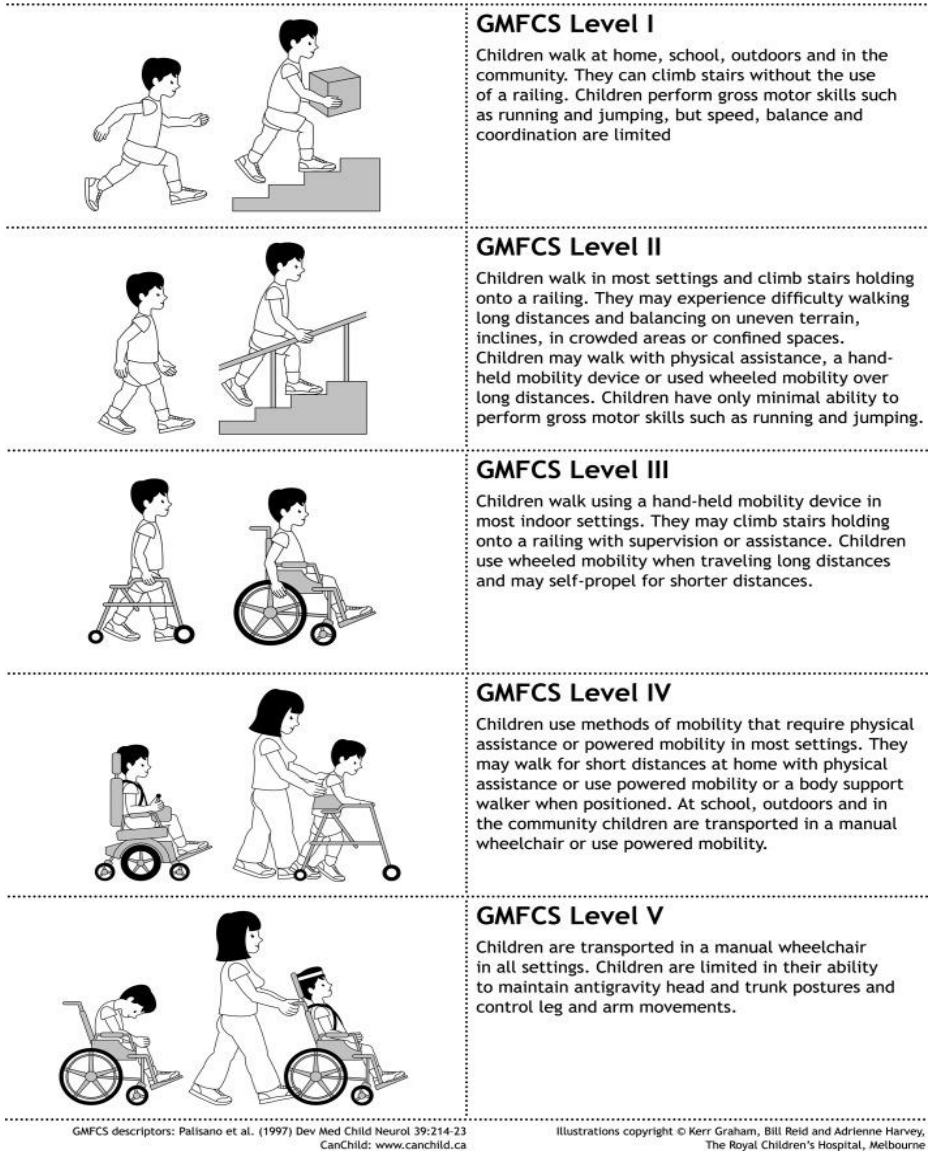
Spastic Hip Displacement

Hip Displacement *IS NOT* related to Motor Type

Hip Displacement *IS* Related to GMFCS Level

Based on 3 population based studies, in JBJS (Am) 2006;88:121-129
BMC Musc. Diseases. 2007;8:101-107
J Pediatrics and Child Health 2009

GMFCS: GROSS MOTOR FUNCTION CLASSIFICATION SYSTEM



GMFCS Level I

Children walk at home, school, outdoors and in the community. They can climb stairs without the use of a railing. Children perform gross motor skills such as running and jumping, but speed, balance and coordination are limited

GMFCS Level II

Children walk in most settings and climb stairs holding onto a railing. They may experience difficulty walking long distances and balancing on uneven terrain, inclines, in crowded areas or confined spaces. Children may walk with physical assistance, a hand-held mobility device or used wheeled mobility over long distances. Children have only minimal ability to perform gross motor skills such as running and jumping.

GMFCS Level III

Children walk using a hand-held mobility device in most indoor settings. They may climb stairs holding onto a railing with supervision or assistance. Children use wheeled mobility when traveling long distances and may self-propel for shorter distances.

GMFCS Level IV

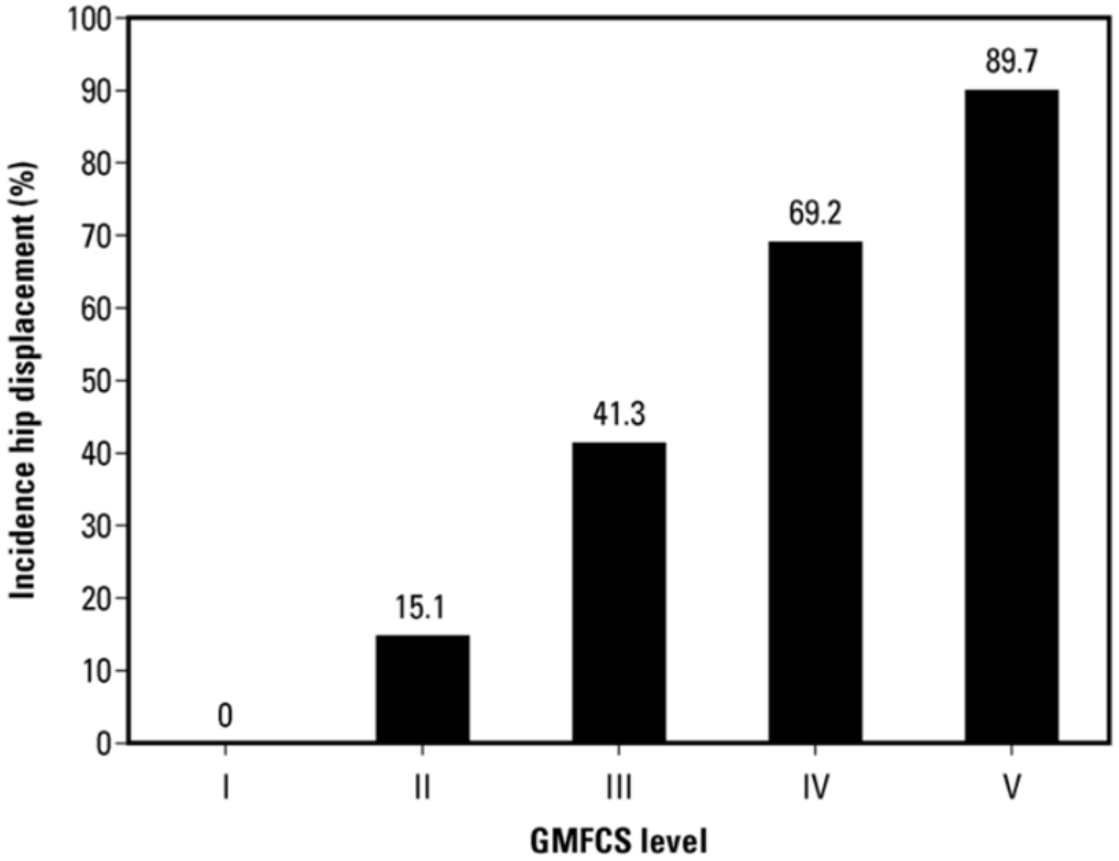
Children use methods of mobility that require physical assistance or powered mobility in most settings. They may walk for short distances at home with physical assistance or use powered mobility or a body support walker when positioned. At school, outdoors and in the community children are transported in a manual wheelchair or use powered mobility.

GMFCS Level V

Children are transported in a manual wheelchair in all settings. Children are limited in their ability to maintain antigravity head and trunk postures and control leg and arm movements.

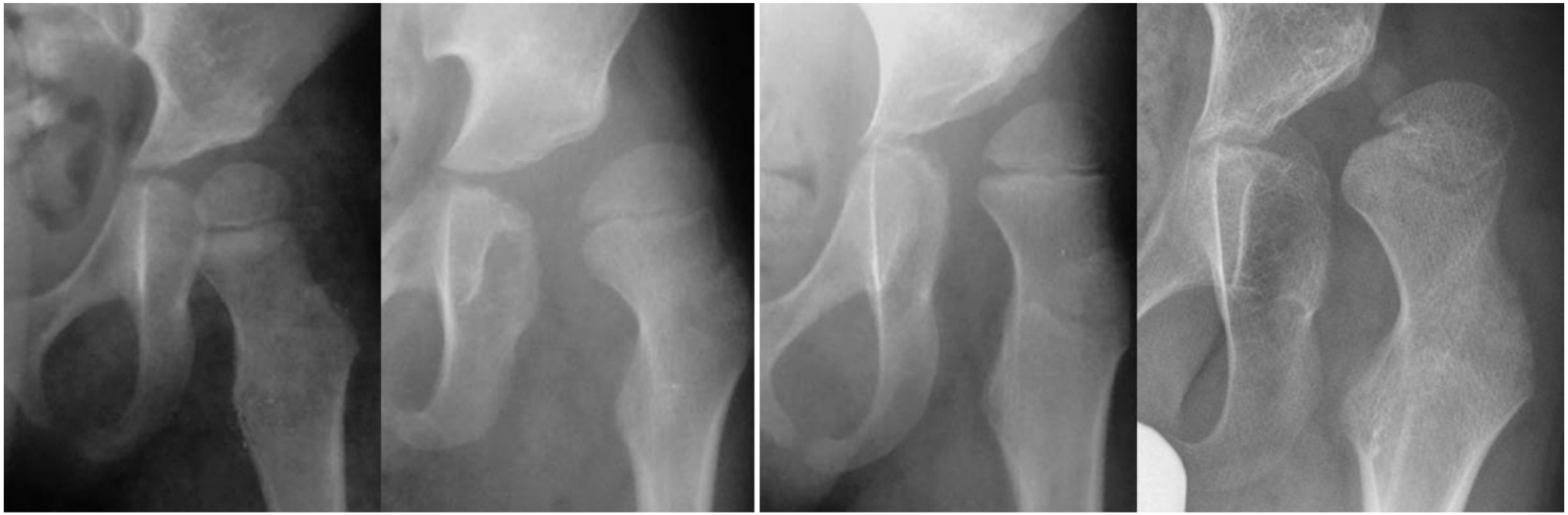
GMFCS descriptors: Palisano et al. (1997) Dev Med Child Neurol 39:214-23
CanChild: www.canchild.ca

HIP DISPLACEMENT AND GMFCS LEVELS



Incidence of hip displacement (a migration percentage of >30%) according to the Gross Motor Function Classification System (GMFCS) level.

Soo et al., JBJS 2006; 88-A (1):121-9



Loss of ROM
Loss of Gross Motor Function
Pain

Decreased quality of life
Increased difficulty with caregiving
More complex surgery

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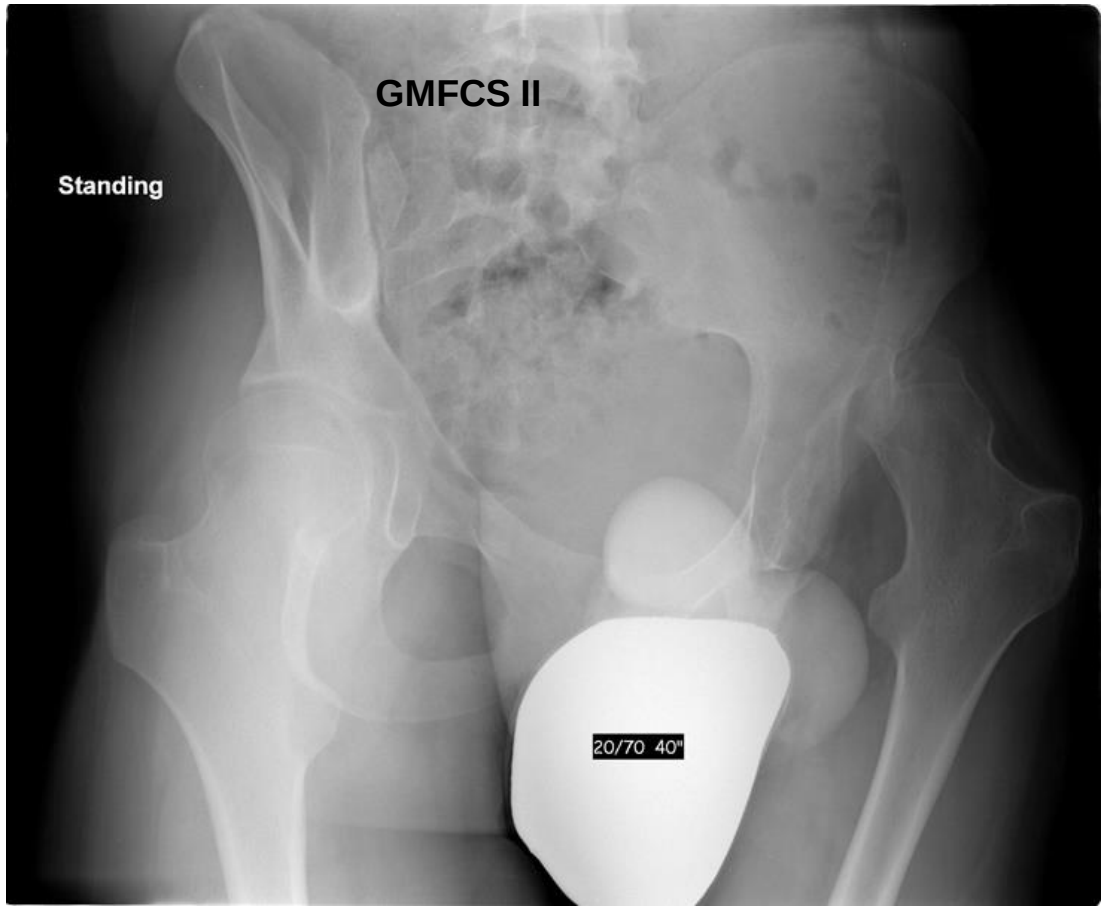
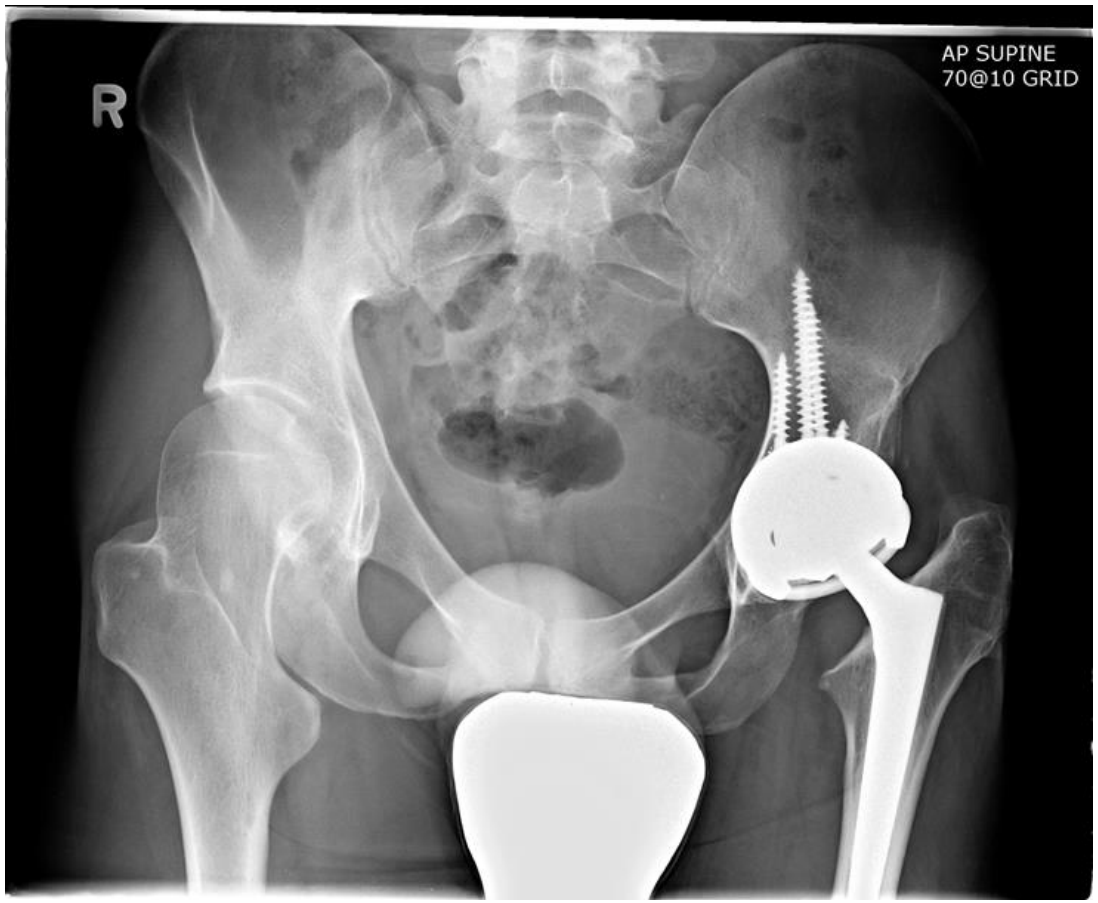
CONSEQUENCES: MOBILITY



Age 17 years



Age 22 years

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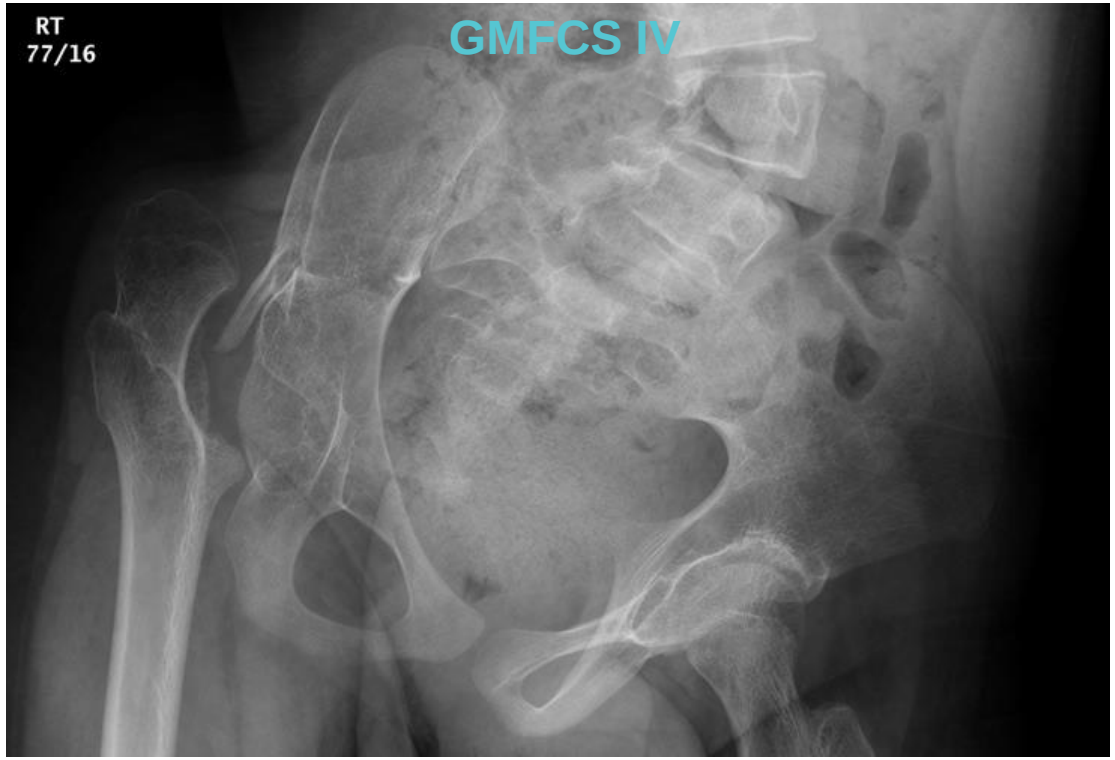
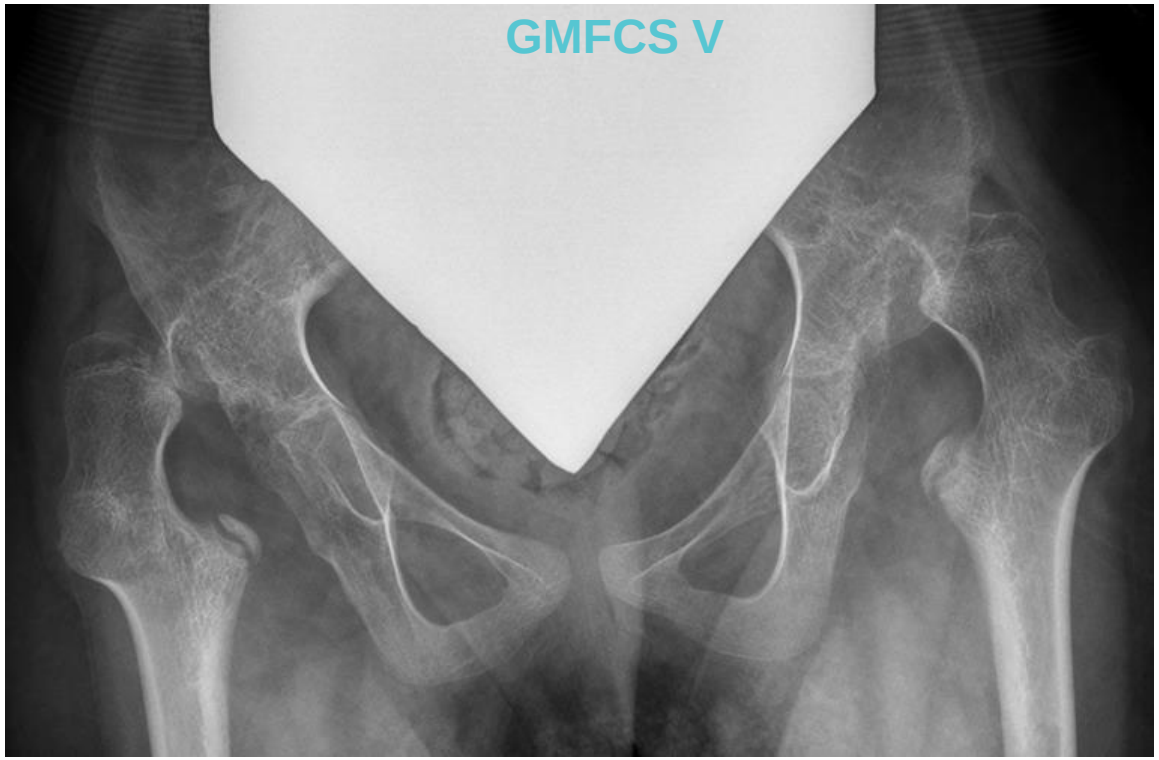
CONSEQUENCES: MOBILITY



Age 14 years



Age 11 years

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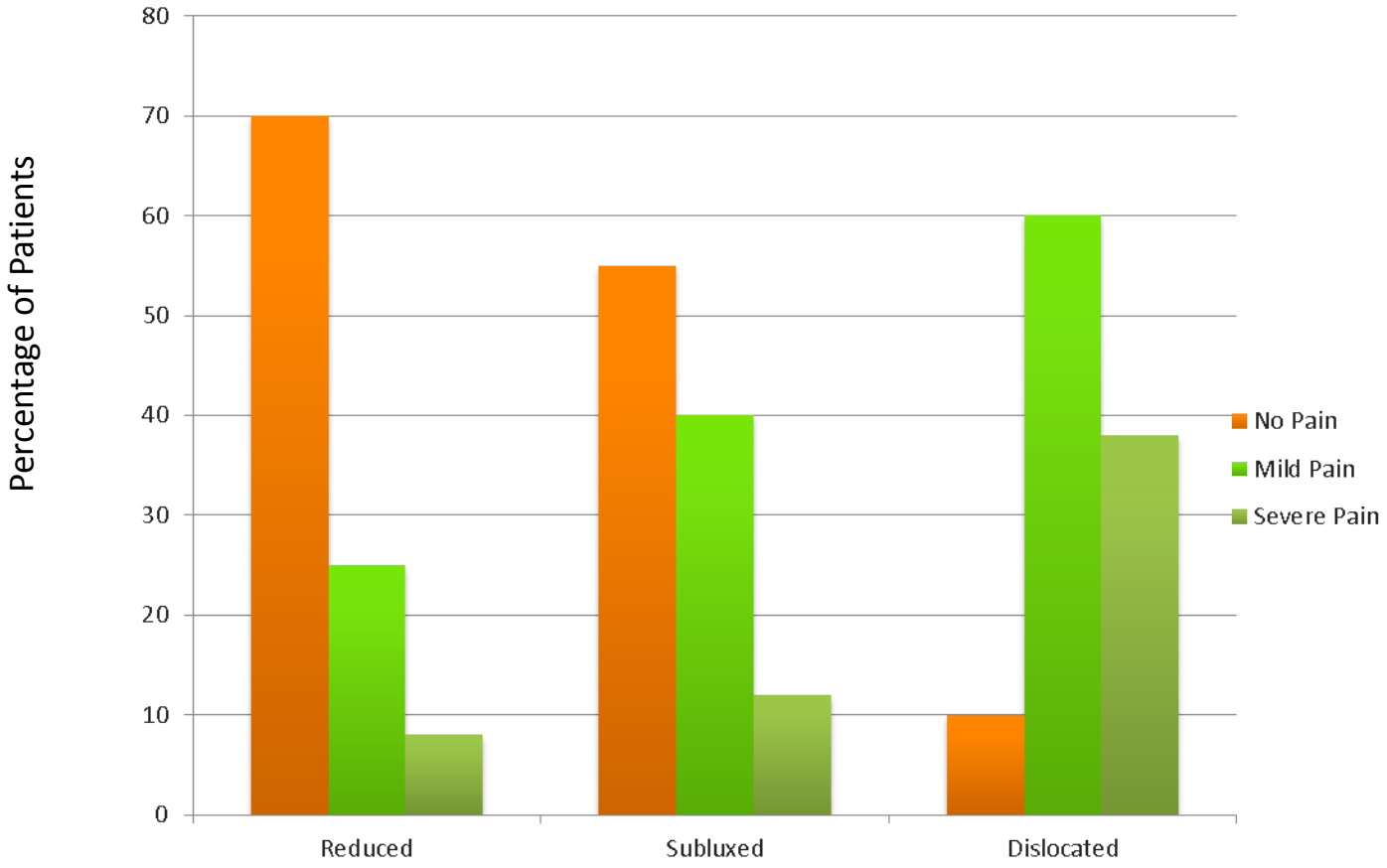
CONSEQUENCES



Relationship of hip position to pain at final follow-up: Amount of hip pain correlated with hip position at final examination. Dislocated hips had statistically more significant pain than located or subluxated hips.

Bagg MR et al., Long-Term follow-up of hip subluxation in cerebral palsy patients. *J Pediatr Orthop.* 1993;13:32-36.

CONSEQUENCES: PAIN & QOL

- Characteristics of pain in children/youth with CP, aged 3-19
- 252 participants
- 54.8% of participants reported some pain
- Physicians reported pain in 38.7%; identified hip subluxation/dislocation as the most common cause of pain

(Penner et al., Pediatrics. 2013;132:e407)

- 34 participants, GMFCS III to V
- Decreased health related quality of life (measured by CPCHILD® questionnaire) with increasing hip displacement (MP)

(Jung et. al, Dev Neurorehabil, 2014; 17(6): 420–425

Content Contributed by Child Health BC Hip Surveillance Program

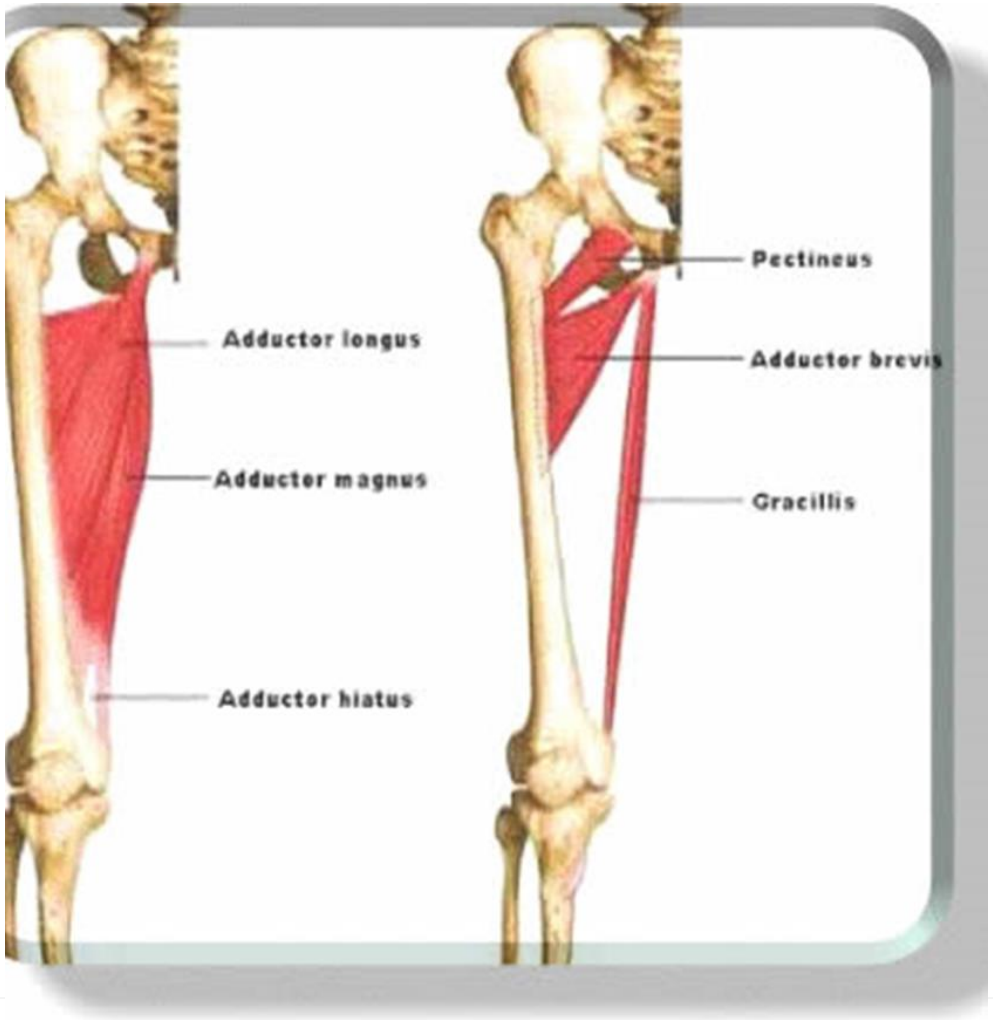
Depends on:

- extent of hip displacement
- secondary bony changes
- age
- pain
- child and family wishes

Early detection = Treatment options remain open

Content Contributed by Child Health BC Hip Surveillance Program

SURGICAL INTERVENTION: “PREVENTATIVE”

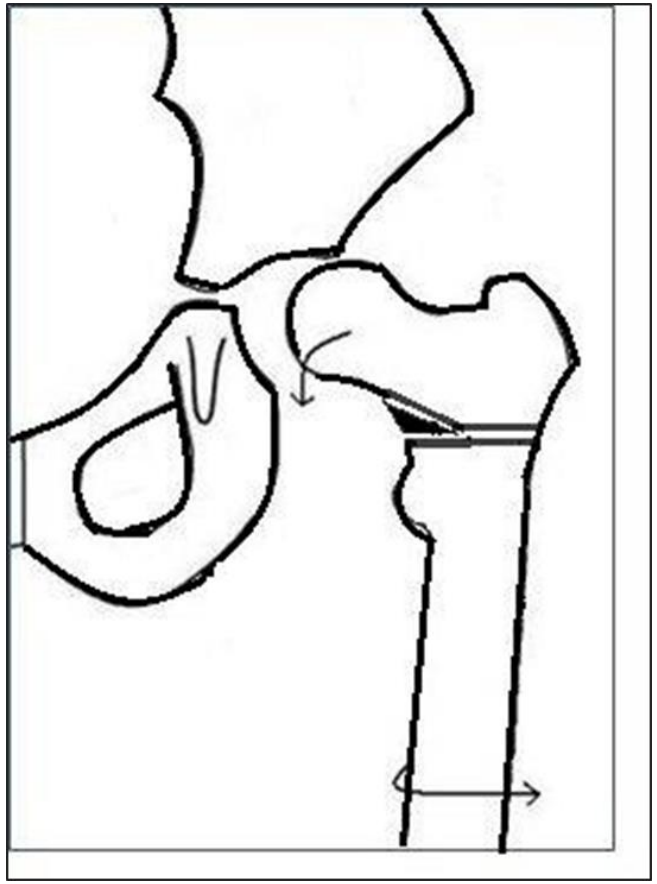


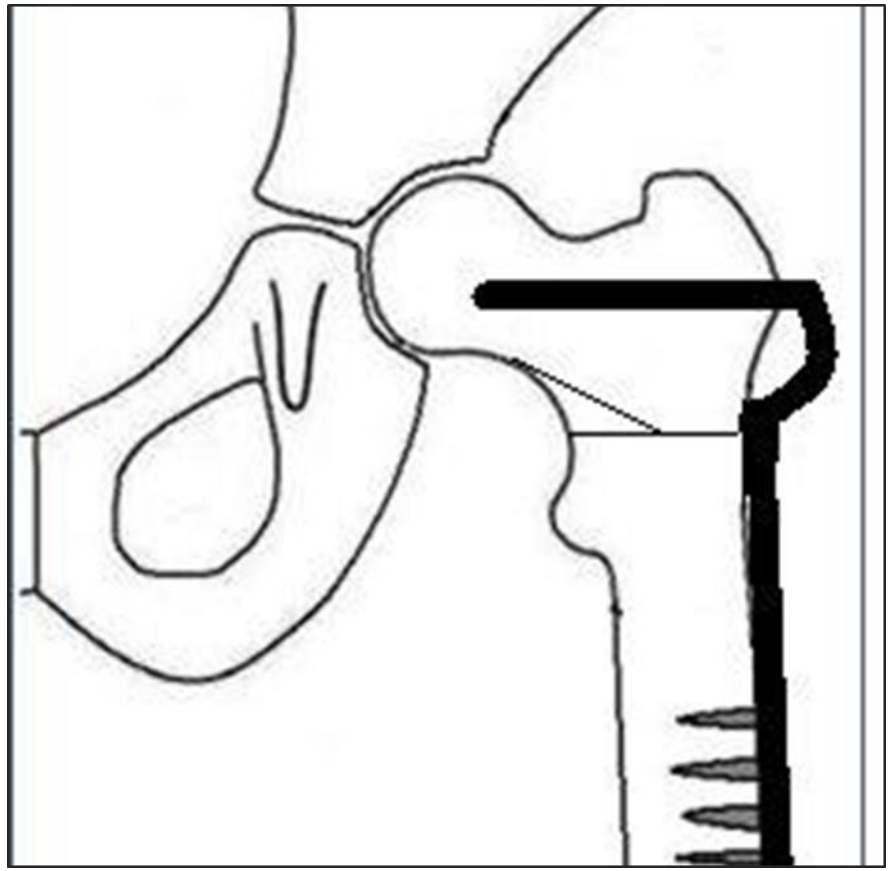
Soft Tissue release

- Adductor longus release
- Gracilis release
- Adductor brevis release
- Iliopsoas lengthening
- Obturator neurectomy

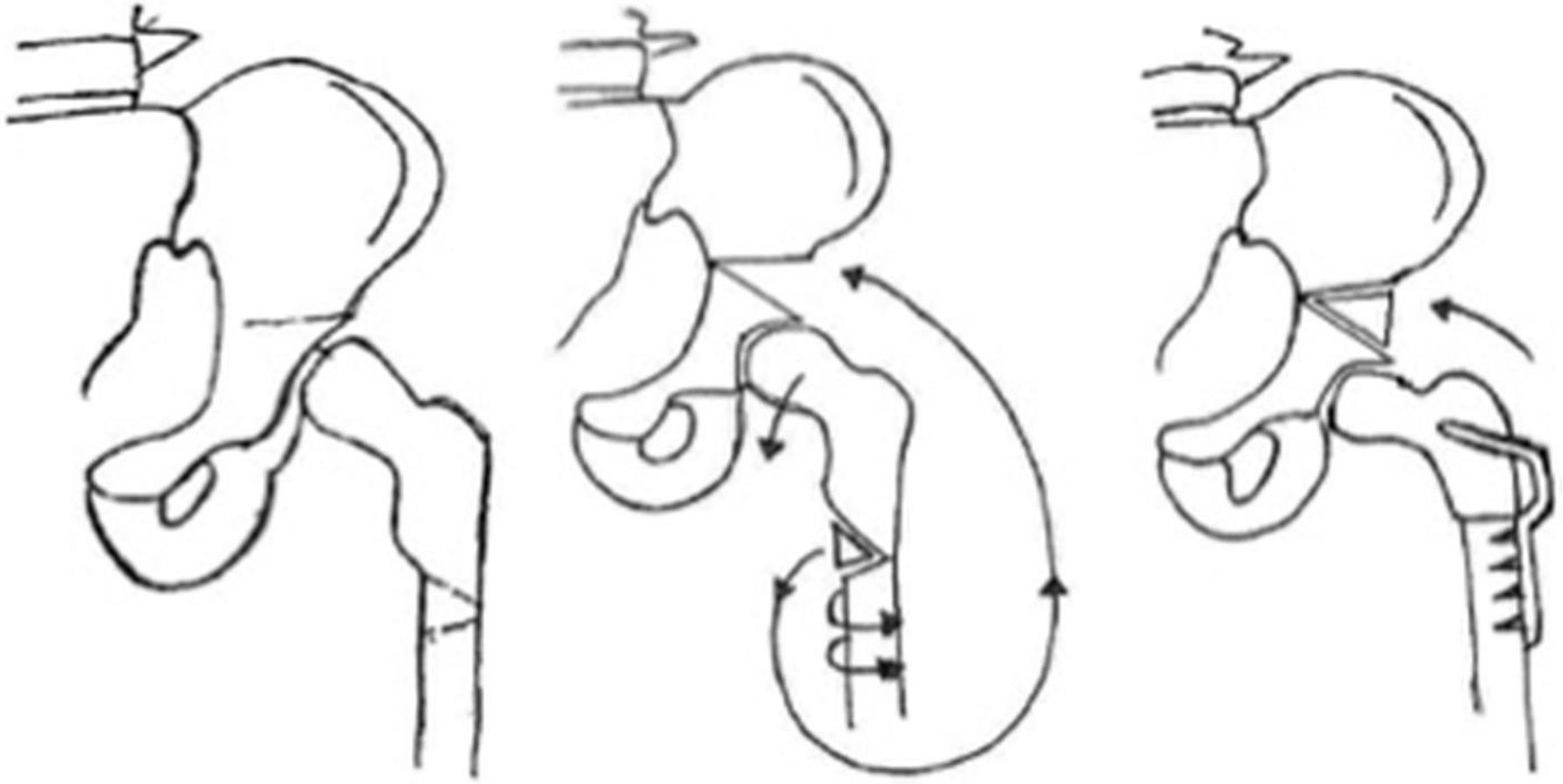
SURGICAL INTERVENTION: RECONSTRUCTION

Varus Derotation osteotomy (VDRO)
+/- pelvic osteotomy (PO)

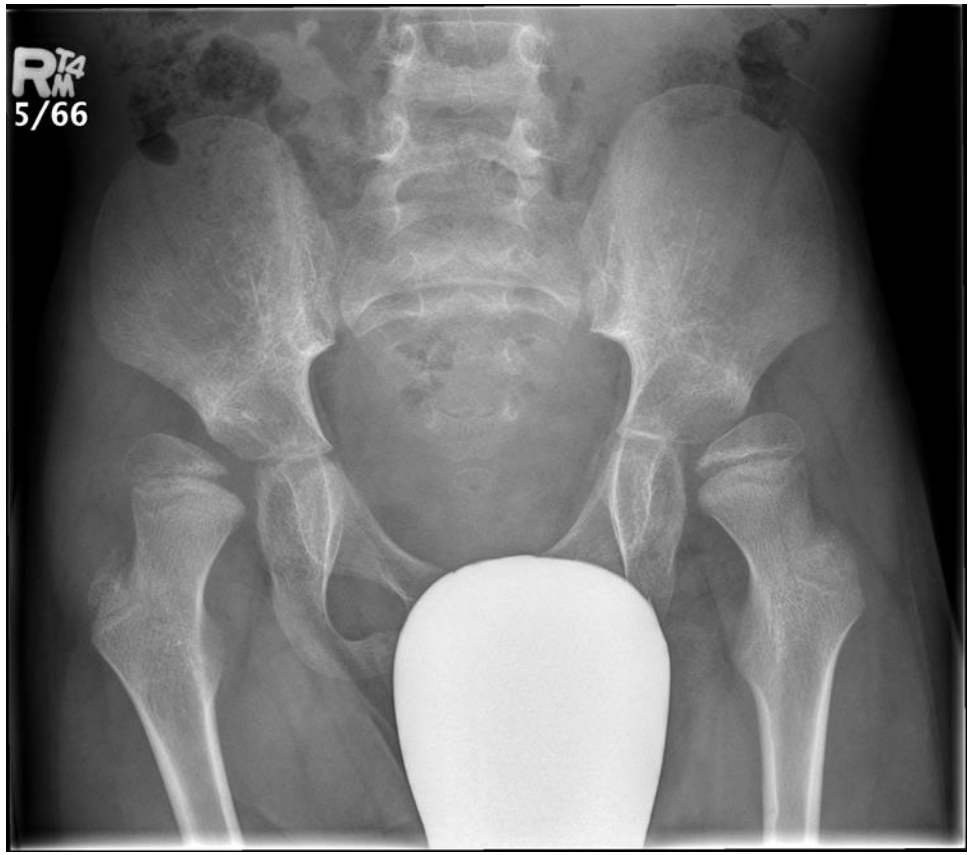




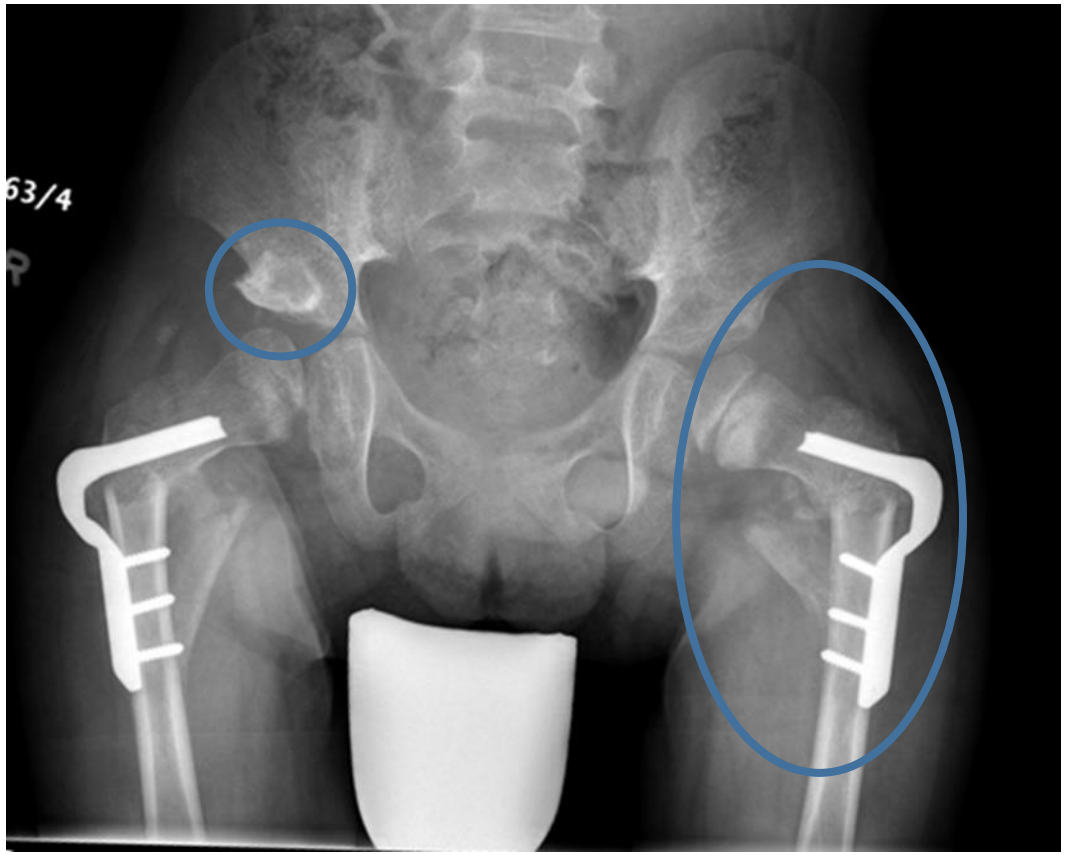
VDRO + PO



SURGICAL INTERVENTION: RECONSTRUCTION



Pre-operative



Post-operative

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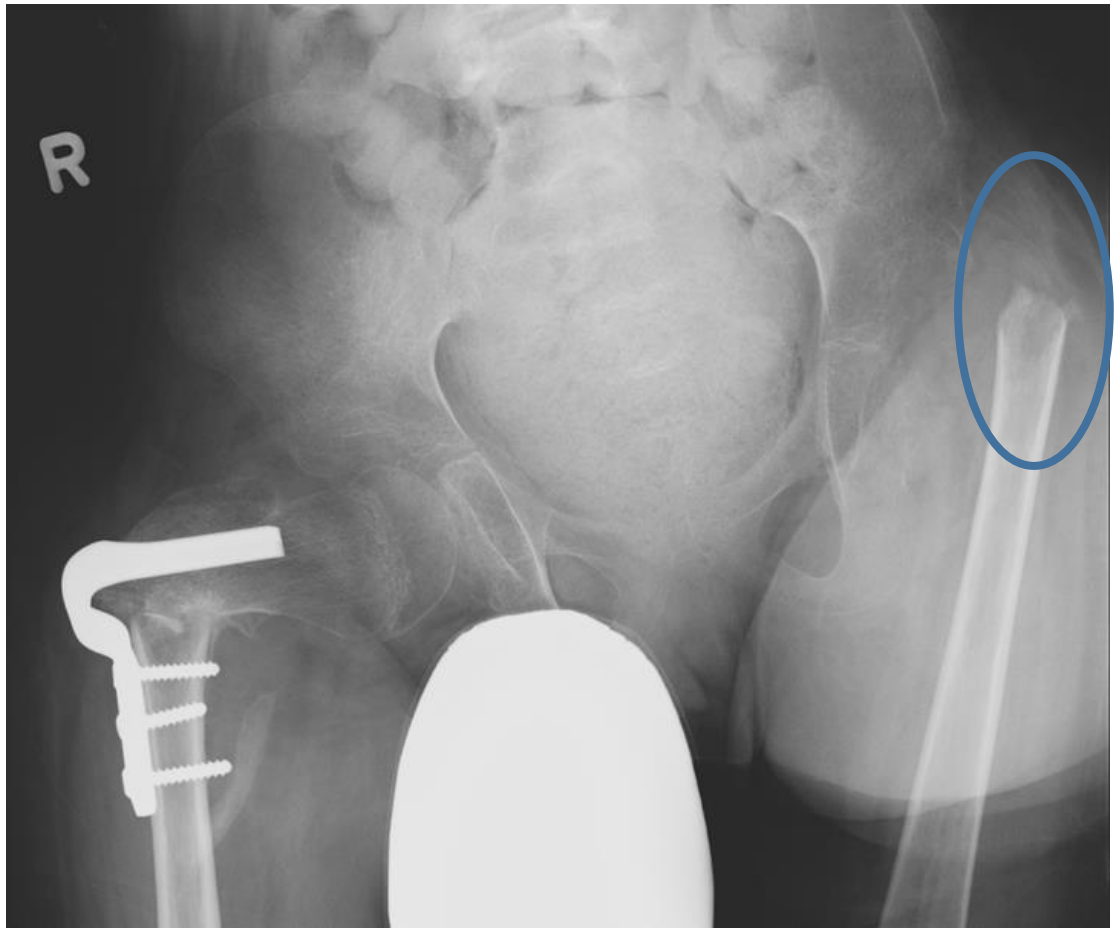
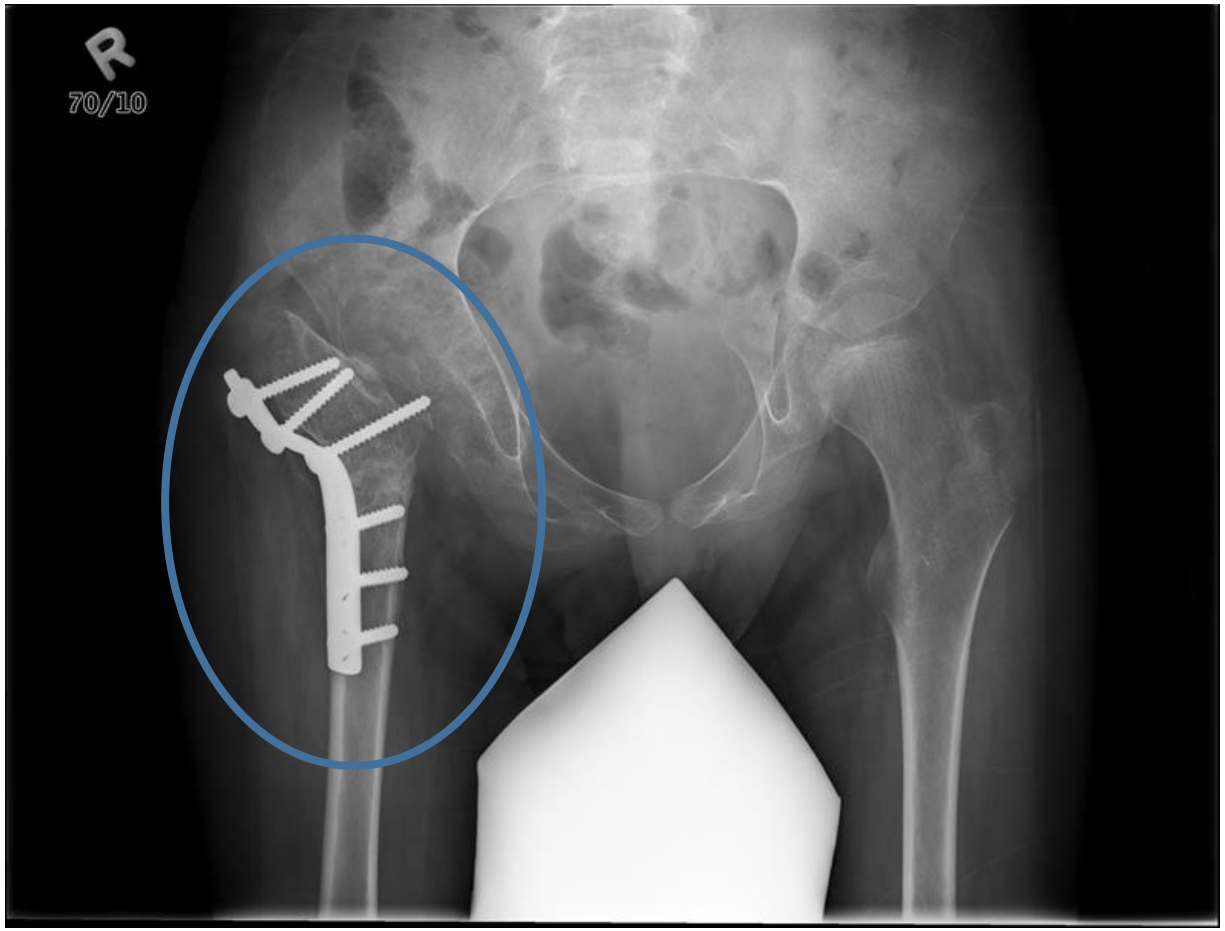
SURGICAL INTERVENTION: SALVAGE PROCEDURE





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HIP SURVEILLANCE

- Identify and monitor early indicators of hip displacement by an active screening program
- Aim: refer to a pediatric orthopedic surgeon at the appropriate time
- Has 2 components: clinical and radiological exams
- First programs established in Sweden and Australia
- Also now exist in: Norway, Denmark, Iceland, Scotland, British Columbia

HIP SURVEILLANCE: AUSTRALIA

- All states had some form of surveillance by 1997
- A national working party was formed in 2006
- Australian Standards of Care published in 2008
- Revised in 2014

I	II	III	IV	V
Age 12-24 mo Age 3 and 5: Clinical exam only (**no x-ray**)	Age 12-24 mo 12 mo later, 4-5 years 8-10 years Review annually if abnormal or unstable Continue annually after skeletal maturity if risk factors present	Age 12-24 mo 6 months later 6 monthly if abnormal or unstable; Annually once stable X-ray at age 7yrs, 6 monthly if abnormal or unstable Annual x-rays resume pre-puberty Continue annually after skeletal maturity if risk factors present	Age 12-24 mo 6 months later 6 monthly if abnormal or unstable; Annually once stable X-ray at age 7 years; 6 monthly if abnormal or unstable Annual x-rays resume pre-puberty or 6 monthly until skeletal maturity if risk factors present Continue annually after skeletal maturity if risk factors present	Age 12-24 mo 6 monthly until age 7 years X-ray at age 7 years: If MP <30, annually Continue 6 monthly until skeletal maturity if risk factors present Continue annually after skeletal maturity if risk factors present
<u>WGH Group IV</u> 5 years; annually until stable Review at age 10 yrs, annually until skeletal maturity Continue annually after skeletal maturity if risk factors				

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HIP SURVEILLANCE: SWEDEN

- CPUP – Uppfoljingsprogram For Cerebral Pares (CP registry, Health care program for children with CP)
- Established in southern Sweden in 1994 (all children with CP born in the area since 1992 are included)
- A local PT and OT examine the child and complete an assessment 2x/year until the age of six years then annually
- Results are computerized , Treatment team receives an online report
- Main goal: prevention of hip dislocation and severe contractures

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HIP SURVEILLANCE: SWEDEN

- GMFCS I – No x-rays
- GMFCS II – x-rays at 2 and 6 years
- GMFCS III – V
  - X-ray at diagnosis
  - q12 months until age 8
  - Then individually
- Pure Ataxia – no xrays

Content Contributed by Child Health BC Hip Surveillance Program

A systematic review of the evidence for hip surveillance in children with cerebral palsy

- 6 articles met inclusion criteria
- Hip surveillance allowed early identification of hip subluxation
- Reduced the need for salvage and late reconstructive surgery with its burden of increased morbidity and health related costs

Gordon GS & Simkiss DE. J Bone Joint Surg (Br) 2006;99-B:1492-6

Content Contributed by Child Health BC Hip Surveillance Program

Prevalence of hip dislocation among children with cerebral palsy in regions with and without a surveillance programme: a cross sectional study in Sweden and Norway

- Compare the prevalence of hip dislocation in Norway (no surveillance) and Sweden (surveillance)
- Children born 1996 – 2003, GMFCS levels III – V
- Norway: 27 dislocated hips in 18 children (15.1%; CI: 9.8 - 22.6)
- Sweden: 1 dislocated hip in 1 child (0.7%; 95% CI: 0.01 - 4.0)
- Norwegian children were first operated at a mean age of 7.6 years (SD: 2.9) compared with 5.7 years (SD: 2.3) in Sweden

Elkamil et al., BMC Musculoskelet Disord 2011; 12:284

Content Contributed by Child Health BC Hip Surveillance Program

Five-year outcome of state-wide hip surveillance of children and adolescents with cerebral palsy

- Queensland, Australia state-wide program commenced in 2005
- Enrolled 1,115 children (73% of expected)
- No child has progressed to dislocation while on surveillance without orthopedic review
- Successful at:
  - Correctly identifying children with hip displacement (MP > 30%)
  - Fast tracking children for orthopedic review
  - Discharging those at minimal risk
  - Preventing silent hip dislocation

Kentish et al., J ped Rehab Med, 2011: 205-217

Content Contributed by Child Health BC Hip Surveillance Program

CHILDREN'S ORTHOPAEDICS

Prevention of dislocation of the hip in children with cerebral palsy

20-YEAR RESULTS OF A POPULATION-BASED PREVENTION PROGRAMME

- Dislocation rate
  - 8% historical control group (n = 103) (born 1990-1991)
  - 0.5% in children born 1992-1997 (n = 258)
  - 0% in children born 1998-2007 (n = 431)
- All children with a dislocated hip reported severe pain
- 13% of children under surveillance had surgery (adductor lengthening or VDRO+/- pelvic osteotomy)
- Conclusion: a population-based hip surveillance program enables the early identification and preventive treatment

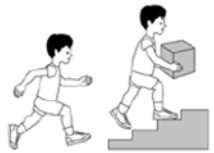
Hagglund et al., Bone Joint J 2014; 96-B:1546-52

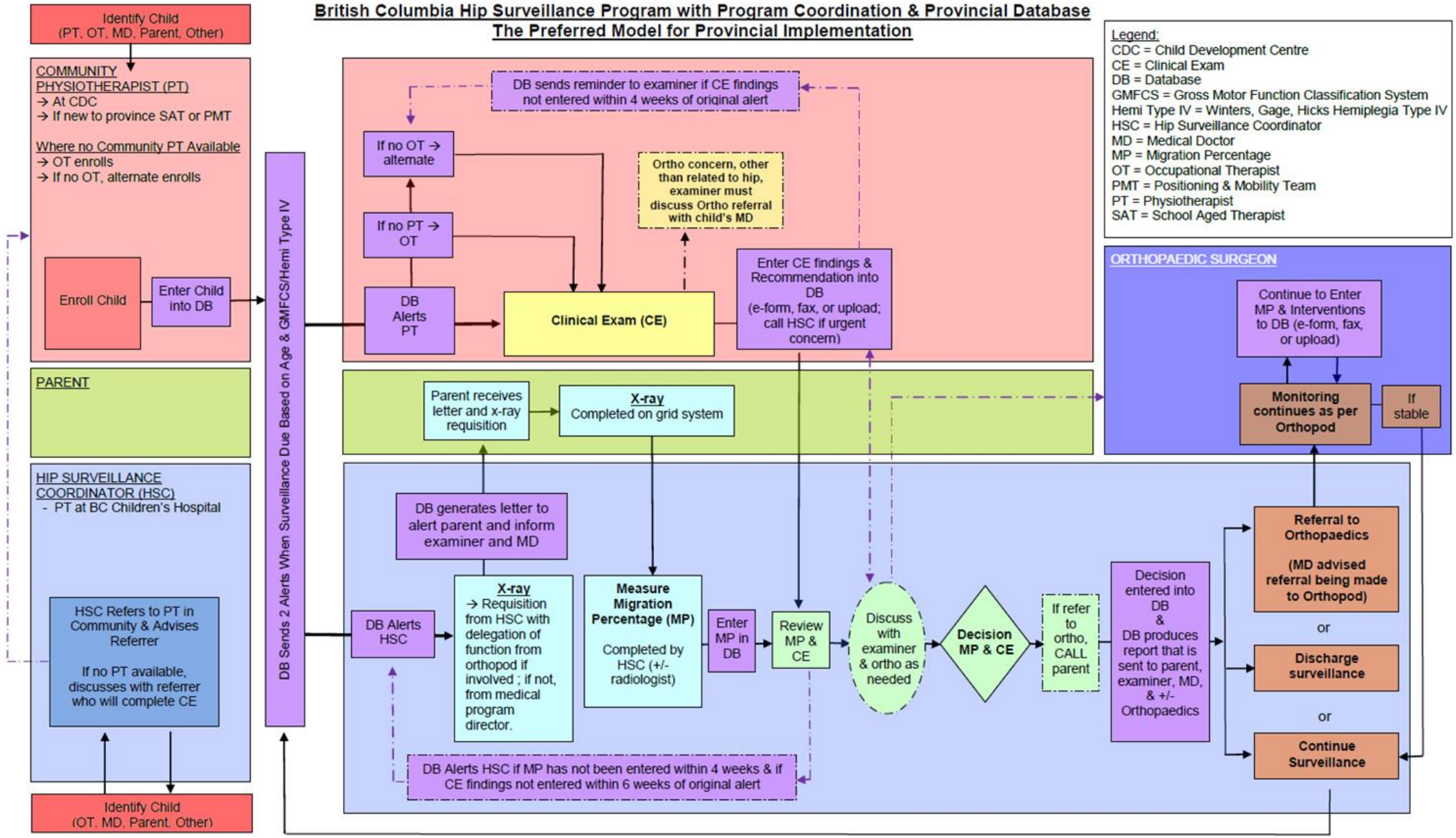
Content Contributed by Child Health BC Hip Surveillance Program

British Columbia Consensus on Hip Surveillance

for Children with Cerebral Palsy[1]

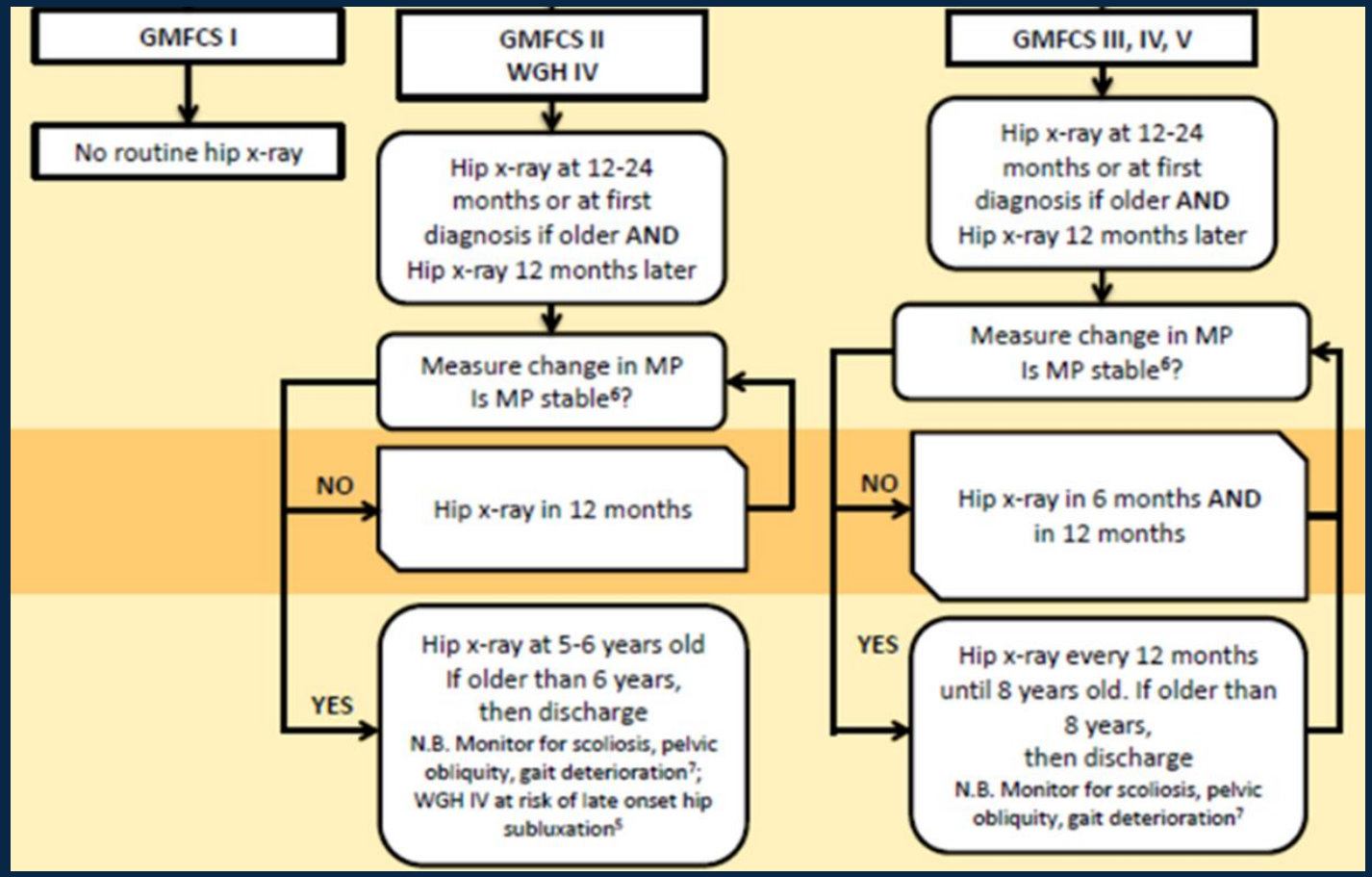
QUICK GUIDE

Classification	Age in Years										
	ID	2	2.5	3	3.5	4	4.5	5	5.5	6	Continue Until Bones Stop Growing (on X-ray)
 GMFCS I[2,3]  GMFCS II[2,3]											
 GMFCS III[2,3]											Every year / Every 2 years
 GMFCS IV[2,3]  GMFCS V[2,3]											Every year / Every year
 Group IV Hemiplegic Gait[4,5]											Every year / Every year


British Columbia Hip Surveillance Program with Program Coordination & Provincial Database
The Preferred Model for Provincial Implementation
Identify Child
(PT, OT, MD, Parent, Other)
COMMUNITY PHYSIOTHERAPIST (PT)
→ At CDC
→ If new to province SAT or PMT
Where no Community PT Available
→ OT enrolls
→ If no OT, alternate enrolls
Enroll Child
Enter Child into DB
PARENT
HIP SURVEILLANCE COORDINATOR (HSC)
- PT at BC Children's Hospital
HSC Refers to PT in Community & Advises Referrer
If no PT available, discusses with referrer who will complete CE
Identify Child
(OT, MD, Parent, Other)
DB Sends 2 Alerts When Surveillance Due Based on Age & GMFCS/Hemi Type IV
DB sends reminder to examiner if CE findings not entered within 4 weeks of original alert
If no OT → alternate
If no PT → OT
DB Alerts PT
Ortho concern, other than related to hip, examiner must discuss Ortho referral with child's MD
Clinical Exam (CE)
Enter CE findings & Recommendation into DB
(e-form, fax, or upload; call HSC if urgent concern)
Parent receives letter and x-ray requisition
X-ray
Completed on grid system
DB generates letter to alert parent and inform examiner and MD
DB Alerts HSC
X-ray
→ Requisition from HSC with delegation of function from orthopod if involved ; if not, from medical program director.
Measure Migration Percentage (MP)
Completed by HSC (+/- radiologist)
Enter MP in DB
Review MP & CE
Discuss with examiner & ortho as needed
Decision MP & CE
If refer to ortho, CALL parent
Decision entered into DB & DB produces report that is sent to parent, examiner, MD, & +/- Orthopaedics
DB Alerts HSC if MP has not been entered within 4 weeks & if CE findings not entered within 6 weeks of original alert
ORTHOPAEDIC SURGEON
Continue to Enter MP & Interventions to DB (e-form, fax, or upload)
Monitoring continues as per Orthopod
If stable
Referral to Orthopaedics
(MD advised referral being made to Orthopod)
or
Discharge surveillance
or
Continue Surveillance
Legend:
CDC = Child Development Centre
CE = Clinical Exam
DB = Database
GMFCS = Gross Motor Function Classification System
Hemi Type IV = Winters, Gage, Hicks Hemiplegia Type IV
HSC = Hip Surveillance Coordinator
MD = Medical Doctor
MP = Migration Percentage
OT = Occupational Therapist
PMT = Positioning & Mobility Team
PT = Physiotherapist
SAT = School Aged Therapist

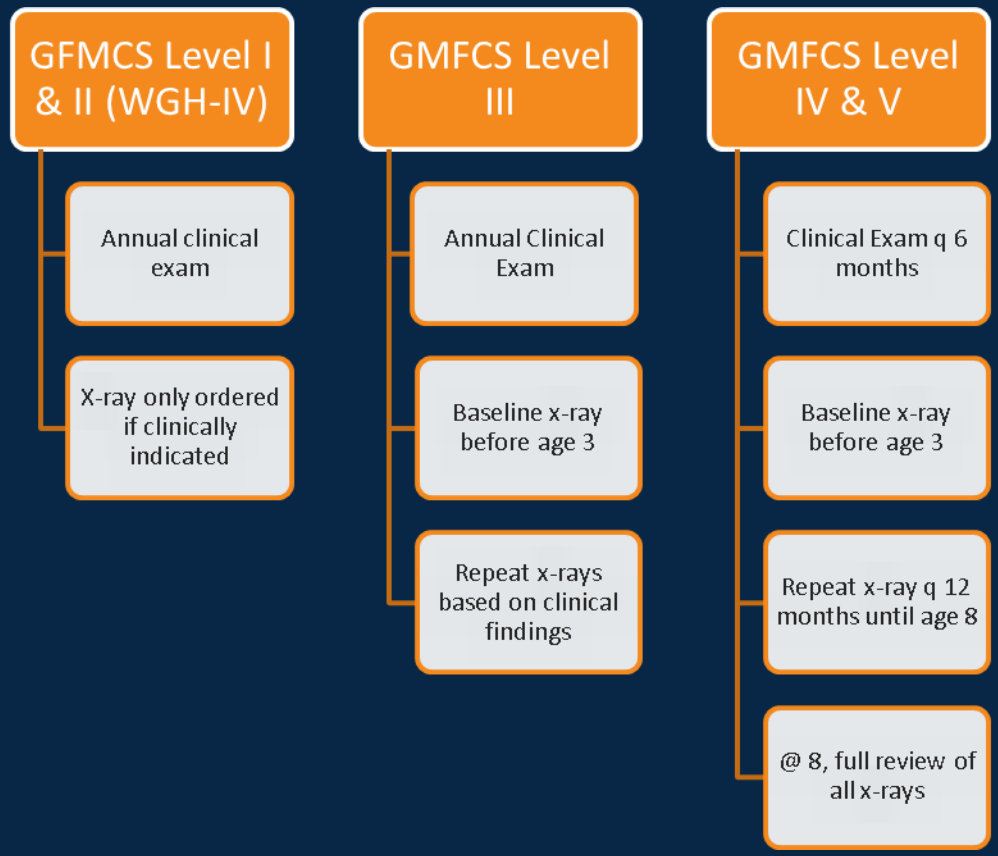
HIP SURVEILLANCE:

Anne Kawamura, Angie Ip, Chun Kim, Peggy Curtis, Shauna Kingsnorth, Darcy Fehlings



Holland Bloorview
Kids Rehabilitation Hospital

HIP SURVEILLANCE



HOW HIP SURVEILLANCE PROGRAMS VARY

- Baseline x-ray timing
- X-ray frequency per GMFCS level
- Criteria to refer to orthopedics
- Discharge from surveillance

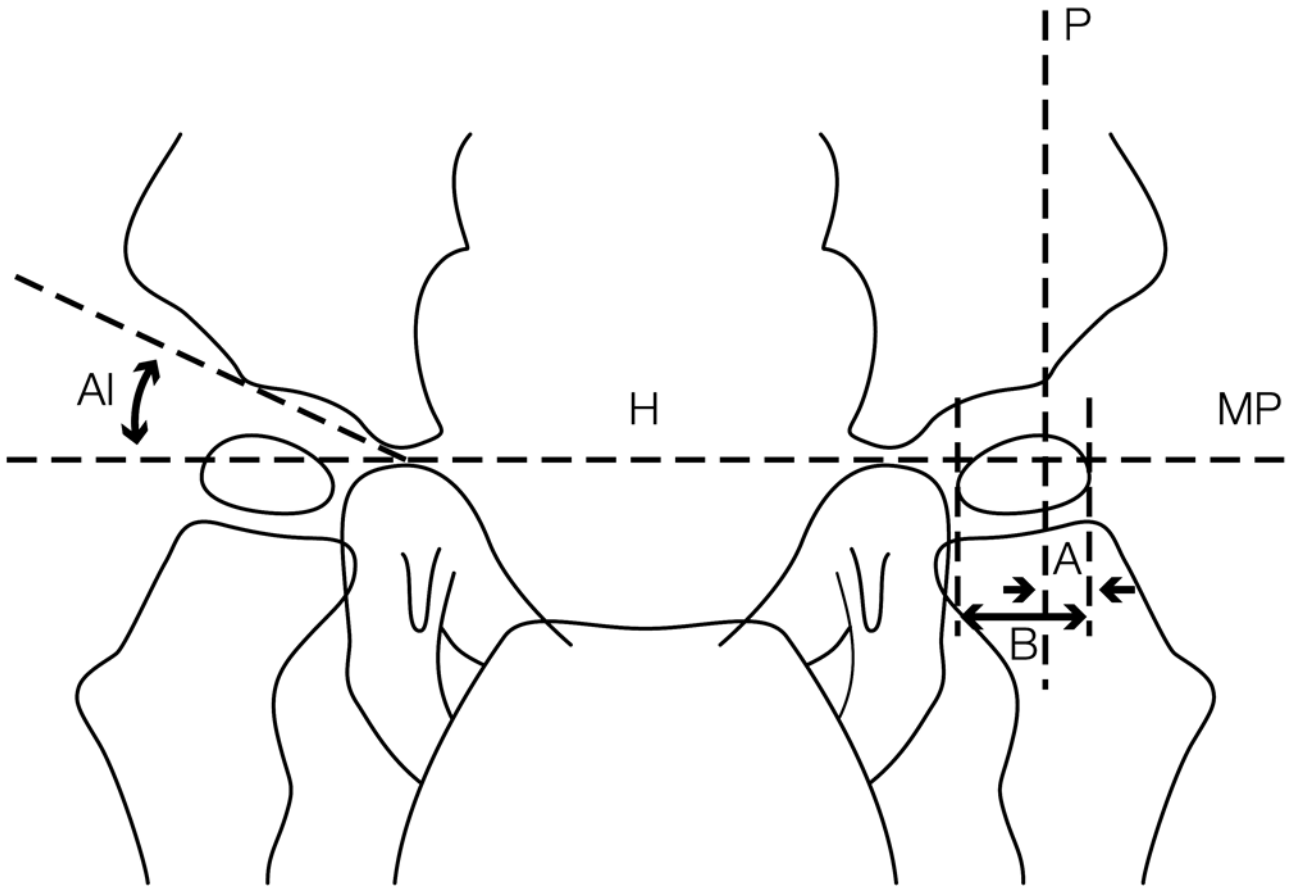
SIMILARITIES IN HIP SURVEILLANCE PROGRAMS

1. Classify GMFCS
2. A/P Pelvis x-ray in standard position
3. Clinical exam
    a. Measure
    b. Ask questions

    For example:

    - Is there hip pain?
    - Has there been a change in function?
    - Are you having difficulty doing peroneal care?

RADIOLOGICAL EXAM

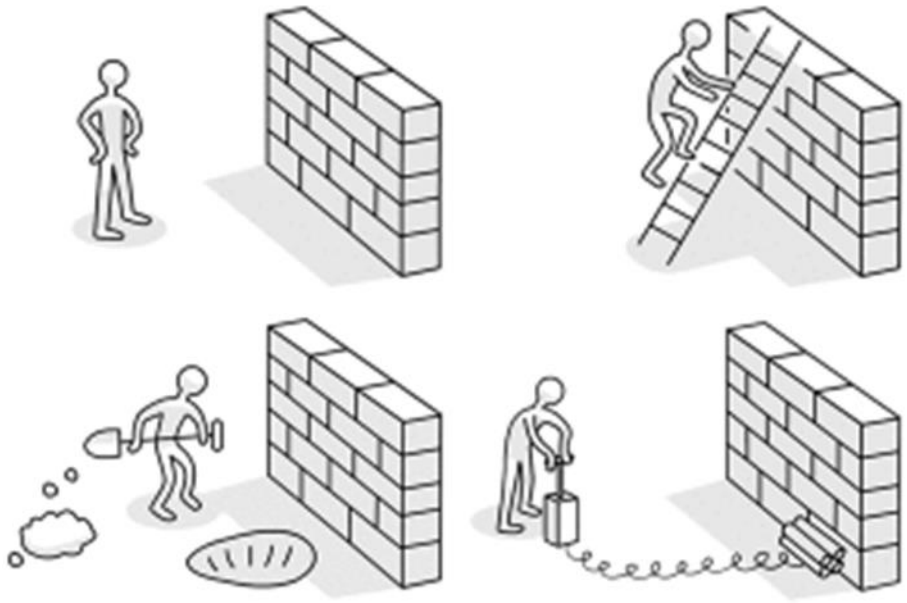


CHALLENGES

- X-Rays : access, orders, positioning, location, reading and reports
- Communication between health care providers
- Responsibilities
- Managing follow ups
- Documentation

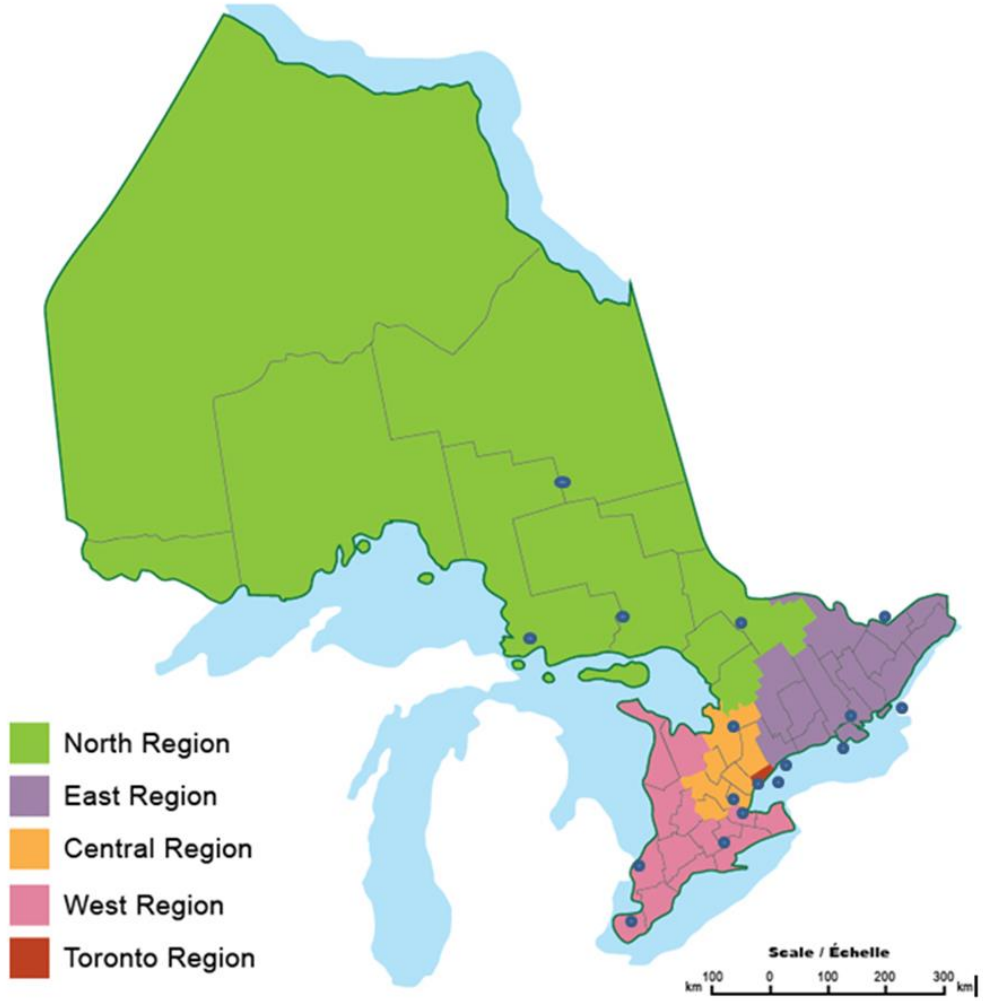
REQUIREMENTS FOR SUCCESS

- Identify those at risk: GMFCS
- Standardized Physical Exam
- Standardized X-rays: AP Pelvis
- Team Approach
- Clear Lines of Responsibility
- Responsive Surgical Services



P. Thomason, Royal Children's Hospital, Melbourne

ONTARIO SURVEY



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HIP SURVEILLANCE PROGRAM
for Children with Cerebral Palsy

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Kids Rehabilitation Hospital

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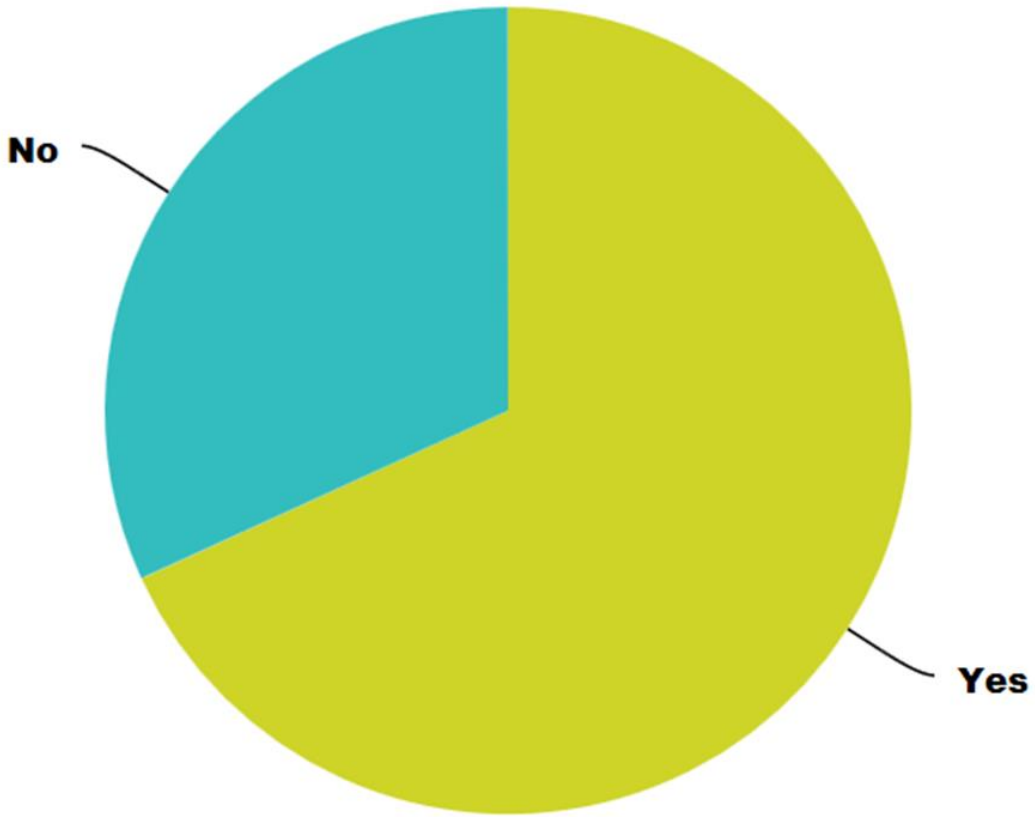
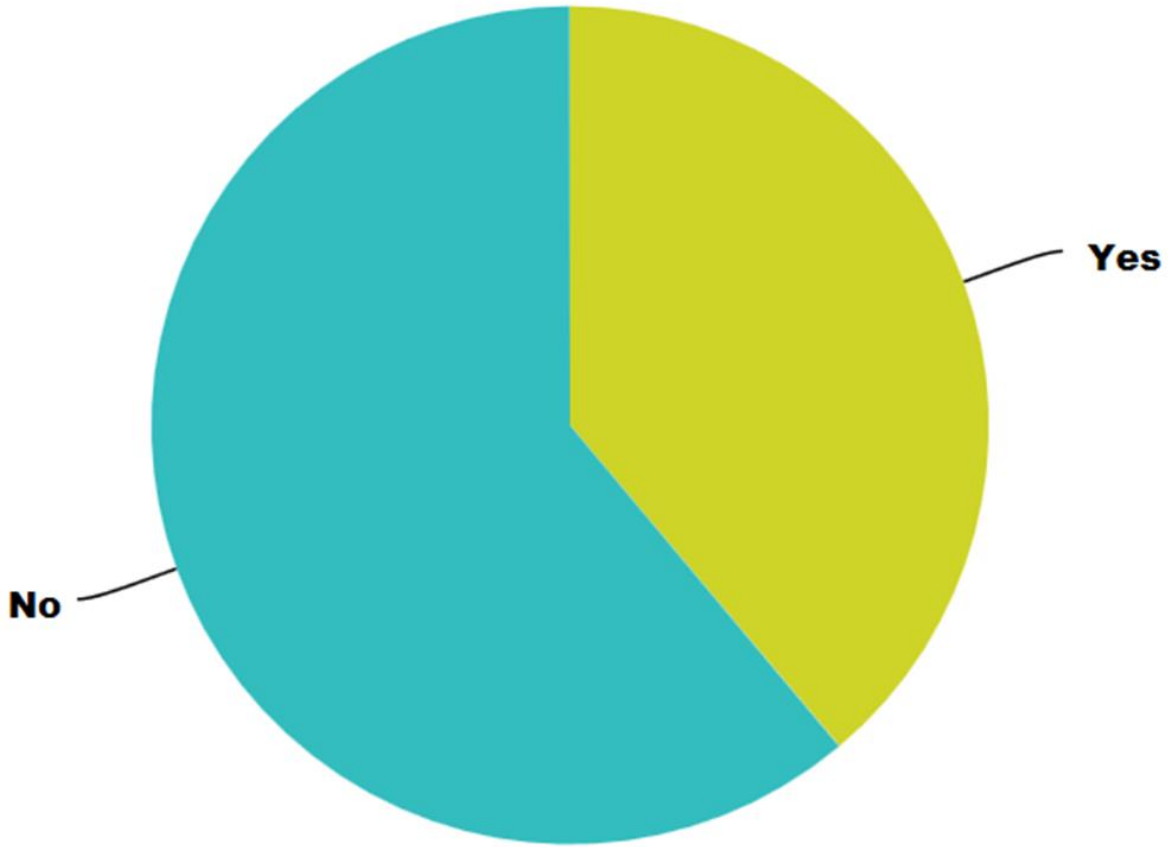
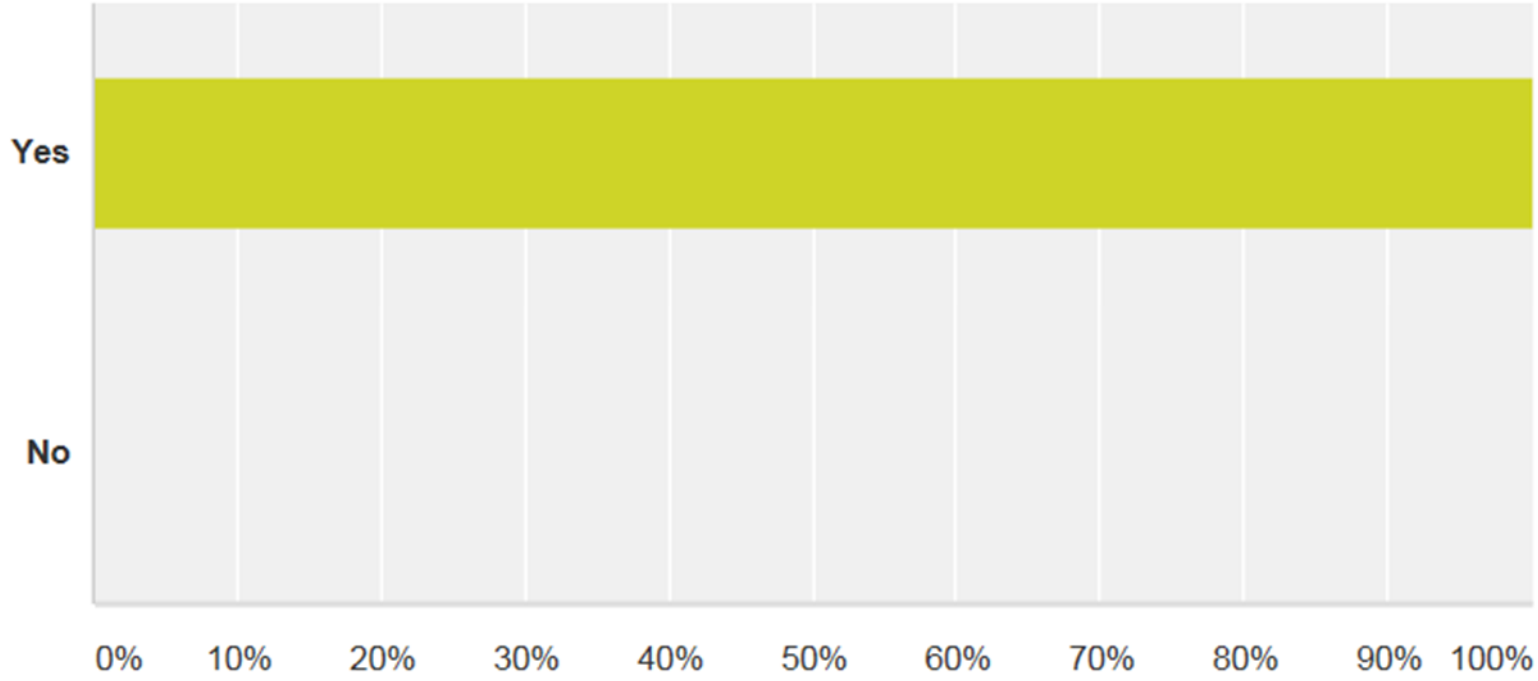
IS SOME FORM OF (RADIOGRAPHIC) HIP SURVEILLANCE BEING DONE AT YOUR SITE?



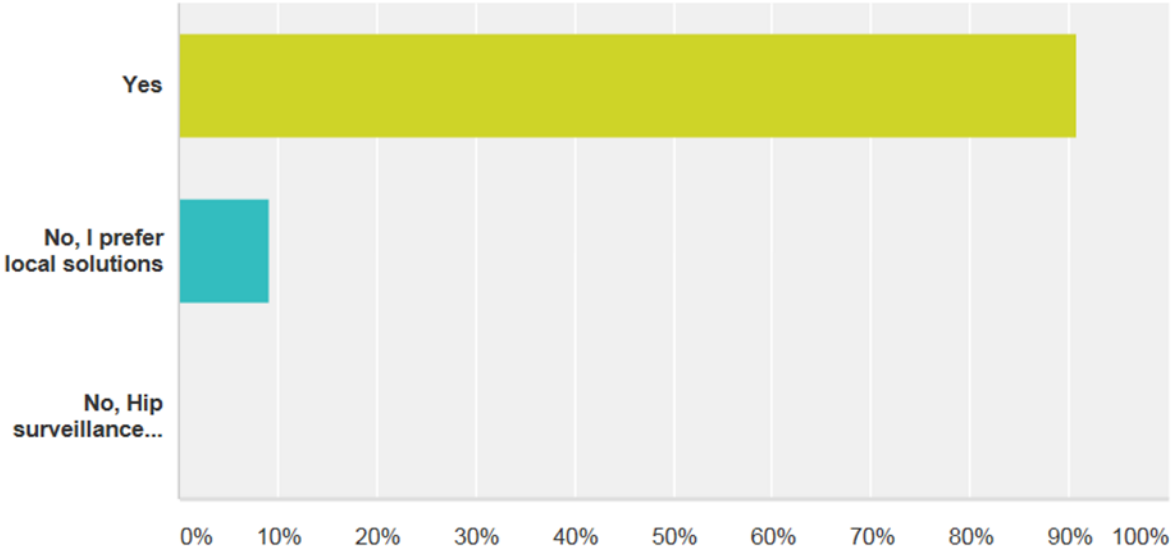
IS THERE A FORMALIZED GUIDELINE (EITHER PRE-EXISTING OR INSTITUTION-SPECIFIC) BEING FOLLOWED?



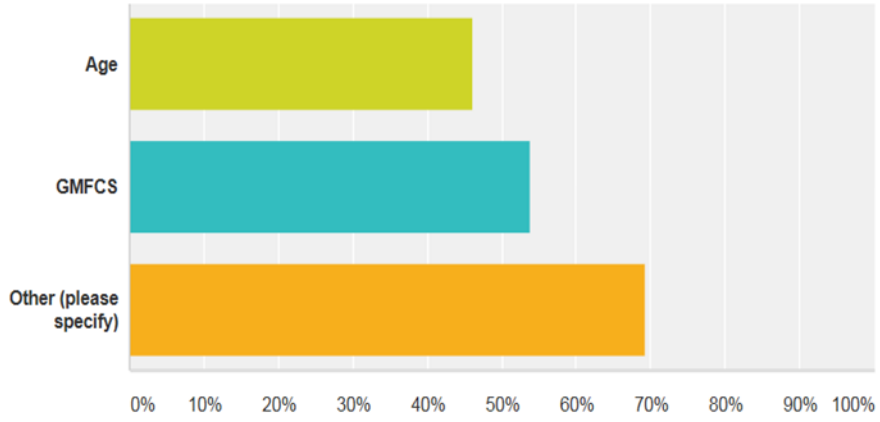
DO YOU THIS HIP SURVEILLANCE IS IMPORTANT/NEEDED IN ONTARIO?



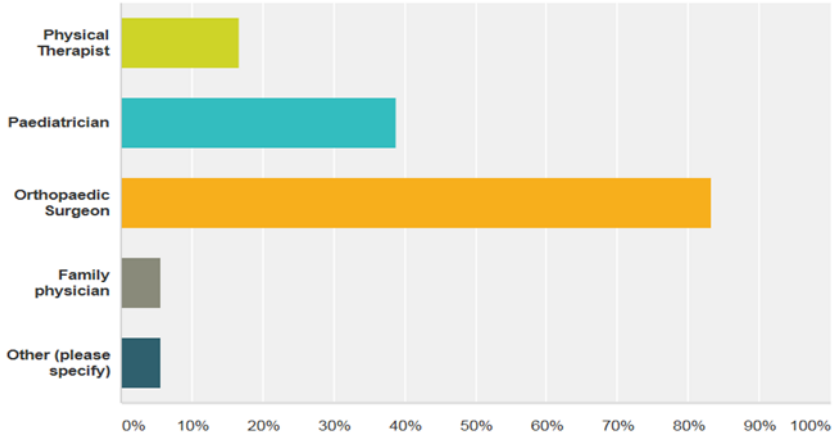
HOW COULD HIP SURVEILLANCE WORK BEST IN ONTARIO?
A PROVINCIAL STRATEGY OR LOCAL INITIATIVES AND WHY?



HOW IS IT BEING DONE IN ONTARIO RIGHT NOW?



If yes, what is the frequency of radiographs based on?



Who monitors the radiographic results/surveillance?

CHILD HEALTH BC LEAD BENEFACTOR save on foods HIP SURVEILLANCE PROGRAM for Children with Cerebral Palsy

Holland Bloorview Kids Rehabilitation Hospital

GrandviewKids

SickKids

UNIVERSITY OF TORONTO

OBSTACLES

- Different guidelines, lack of consensus
- Orthopod attendance at clinic and access to orthopod
- Buy In from physicians and other HCP
- Collaboration of HCP not in same facility
- Communication between physicians/paediatricians/surgeons and therapists
- Family attendance issues
- Transportation in rural/remote areas
- Lack of radiology access
- Radiologist training/ reliability
- legal impediments to physiotherapists measuring migration index
- lack of reimbursement for orthopedic surgeons reviewing radiographs
- Lack of understanding of what is required


IMPORTANT

WHAT DO CLINICIANS DO TOMORROW?

- Ask families and care teams about their most recent hip x-rays
- Advocate for monitoring/request x-rays
- Complete physical exams regularly and identify red flags (appendix)
- Ask questions regularly:
  - Is there hip pain?
  - Has their been a change in function?
  - Are you having difficulty doing peroneal care?

REFER TO ORTHOPEDICS

- MP >30
- Deterioration in hip abduction
- Asymmetry in hip abduction
- Yes to any of the above questions
- ANY OTHER CONCERNS

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ACKNOWLEDGEMENTS

Child Health BC Hip Surveillance Program

- Stacey Miller, Hip Surveillance Coordinator, PT

Holland Bloorview Kids Rehabilitation Hospital

- Anne Kawamura, developmental Paediatrician
- Angie Ip, Developmental Paediatrician
- Peggy Curtis, RN
- Shauna Kingsnorth, PhD
- Darcy Fehlings, Developmental Paediatrican

Grandview Children's Centre

- Carolyn Hunt, Developmental Paediatrician
- Lorraine Sunstrum-Mann, Executive Director
- Linda Laing – Clinical Manager
- Janet Isaac – Clinical Manager
- Marj Kennelly, Physiotherapist
- Unni Narayanan, Orthopaedic Surgeon
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