

Cerebral Palsy- Approach to Diagnosis and Evaluation

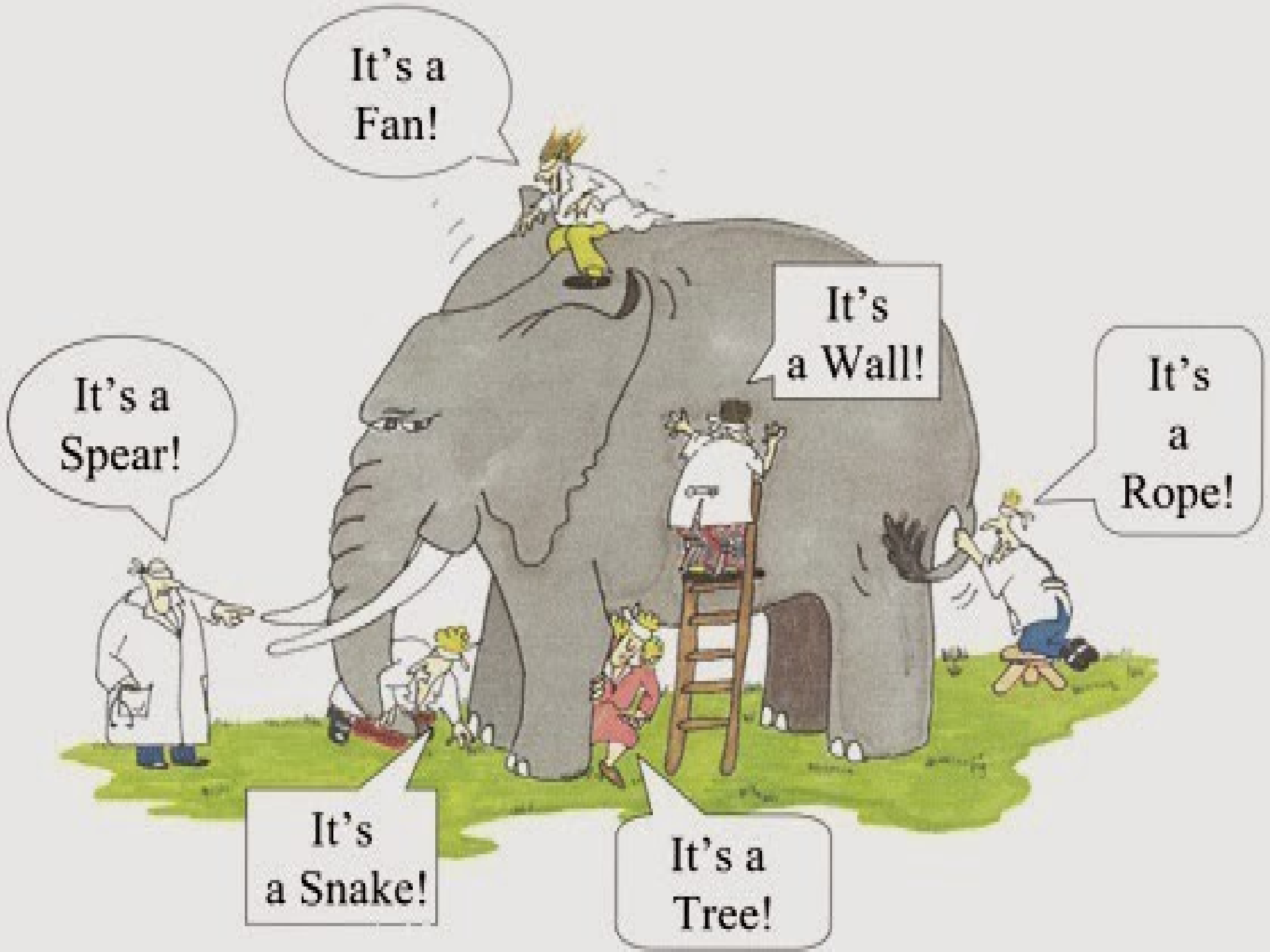
DR SAKTI PRASAD DAS
MS(ORTHO.), DNB(PMR)
CUTTACK, ODISHA

Definition

Cerebral palsy is a group of permanent disorders of the movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain.

Symptoms

- **Delayed milestones**
- **coordination,**
- **Spasticity and weak muscle**
- **Tremors**
- **Sensation issues**
- **Speech and Hearing**
- **Swallowing**



It's a Fan!

It's a Spear!

It's a Wall!

It's a Rope!

It's a Snake!

It's a Tree!

Who are they?

- **Neurologist/Neurosurgeon**
- **Pediatrician**
- **PMR**
- **Special educator**
- **Physiotherapist**
- **Occupational therapist**
- **Orthotist**
- **Psychologist**
- **Social worker**
- **Orthopaedic surgeon**
- **Paediatric orthopaedic surgeon**

Developmental milestones



1 month



2 months



3 months



4 months



5 months



6 months



7 months



8 months



9 months



10 months



11 months



12 months

NEUROPLASTICITY

- **“Neuroplasticity” can be defined as the ability of the nervous system to respond to intrinsic & extrinsic stimuli by reorganizing its structure, function & connections.**

CLASSIFICATION

- **ETIOLOICAL**
- **PART OF BODY AFFECTED**
- **SITE OF BRAIN INJURY**
- **DEPENDING ON MUSCLE TONE**
- **GROSS MOTOR SKILLS- GMFCS**
- **FINE MOTOR SKILL- MACS**
- **Communication- CFCS**

Etiological

Prenatal

- Iron def., poor –nut.
- Inf, UTI, high fever
- Chorioamniotitis
- HTN, DM
- Teratogens
- Poor ANC
- Twins
- Fetal vasculopathy

Perinatal

- Birth asphyxia
- Premature / LBW
- IUGR
- Hyperbilirubenemia
- IVH
- Sepsis, pneumonia, meningitis
- Develop. malformation

Postnatal

- CNS infections
- Head injuries
- Seizures
- Hypoxic damage
- Hyperpyrexia damage

TOPOGRAPHIC

- **MONOPLEGIA**
- **HEMIPLEGIA**
- **DIPLEGIA**
- **QUADRIPLEGIA**
- **DOUBLE
HEMIPLEGIA**
- **TRIPLEGIA**

PHYSIOLOGY

- **SPASTIC**
- **EXTRAPYRAMIDAL**
- **ATAXIC**
- **MIXED**
- **ATONIC**

Site of brain injury

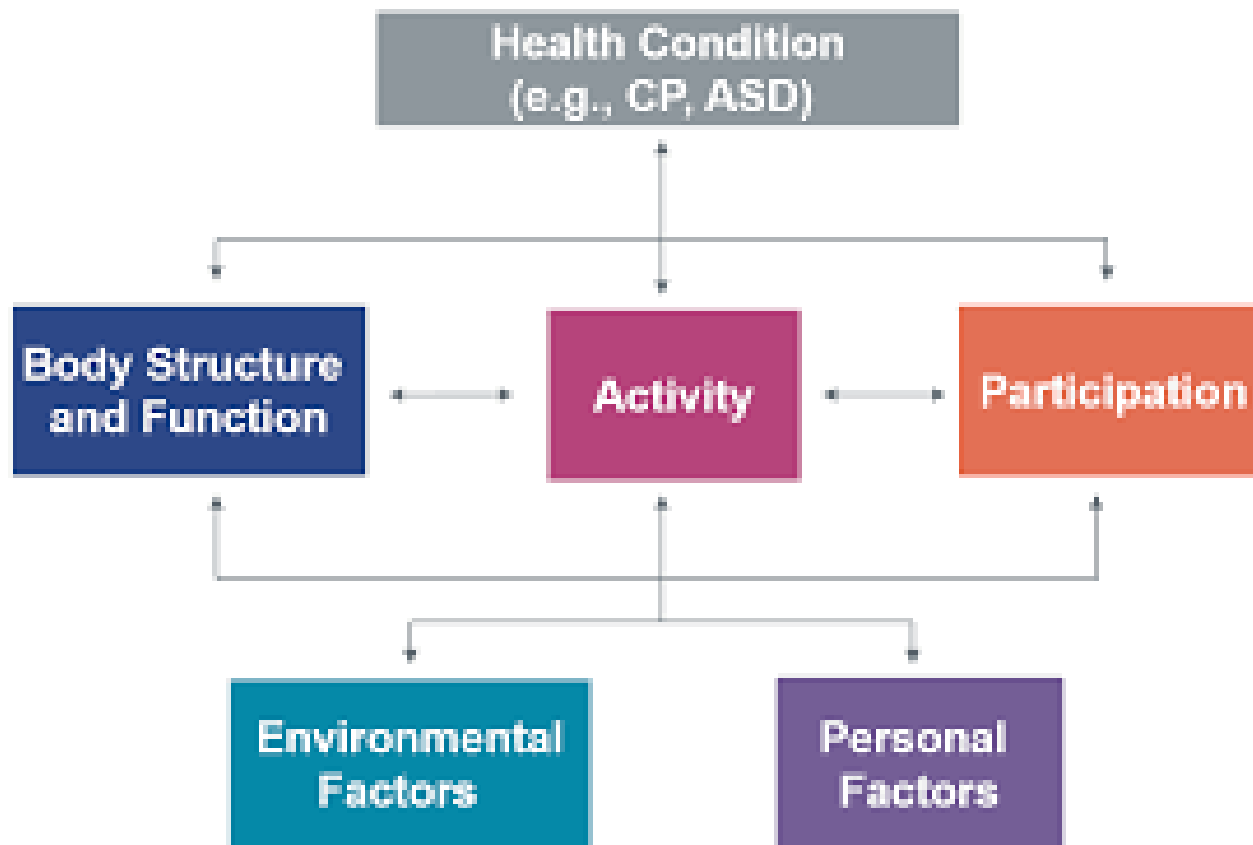
- **Cortical**
- **Sub – cortical**
- **Periventricular**
- **Basal ganglia**
- **Cerebellum**
- **Brain stem**

Pathological

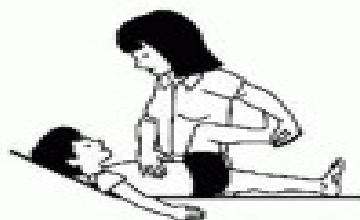
- Periventricular
leucomalacia –**spastic
diplegia**
- Stroke in utero - **hemiplegia**
- Multifocal
encephalomalacia
-**quadriplegia**

Functional Limitation

- **Mobility – GMFCS**
- **Handling Object- MACS**
- **Communication- CFCS**
- **Eating and Drinking- EDACS**



Diagnostic Matrix(Orthopaedic Surgeon)



Standardized physical examination



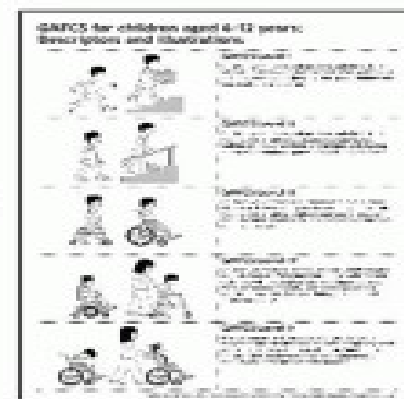
Radiology



Clinical history



GMFCS



Sagittal gait pattern

FMS



Orthopaedic surgeon

- **GMFCS**
- **CLINICAL EXAMINATION**
- **GAIT ANALYSIS**

TIBIAL EXTERNAL ROTATION DEFORMITY



CROUCH



Jump Knee



HALLUX VALGUS



SEVERE DEFORMITIES





- **Shoulder adduction**

- **Elbow flexion**

- **Forearm pronation**

UPPER LIMB

- **Wrist flexion**

- **Finger flexion**

- **Thumb in palm**



PETER ROSENBAUM

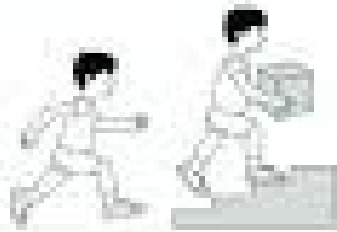
- **GMFCS- a guide to management in CP**



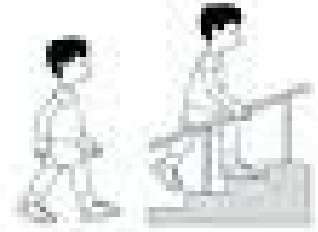
GMFCS E & R between 6th and 12th birthday: Descriptors and illustrations

2-18 Years

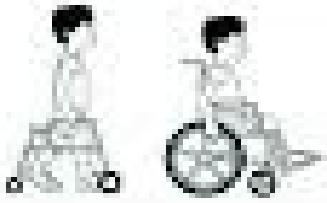
First described in 1997 by Palisano et al



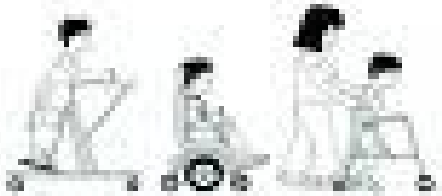
GMFCS Level I
Children walk at home, school, outdoors and in the community. They can walk freely without the use of a walking device. Children perform gross motor skills such as running and jumping, but speed, balance and coordination are limited.



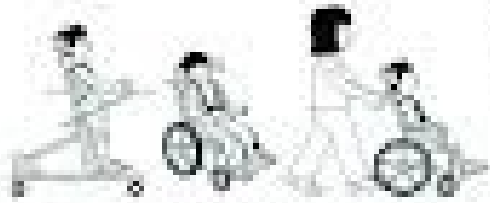
GMFCS Level II
Children walk in most settings and climb steps, leaning onto a railing. They may experience difficulty walking long distances and balancing on uneven terrain, inclines, or crowded areas or confined spaces. Children may walk with physical assistance, a hand-held walking device or wrist-extended mobility arm 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 supporting device in most indoor settings. They may climb stairs leading onto a setting with supervision or assistance. Children use extended mobility arms traveling long distances and may self-propel for short distances.



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

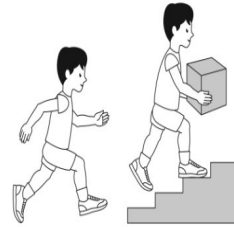


GMFCS Level V
Children are transported in a manual wheelchair to all settings. Children are moved in their ability to maintain independently head and trunk posture and control leg and arm movements.

Natural History Walkers

Non-walkers

GMFCS E & R between 6th and 12th birthday: Descriptors and illustrations



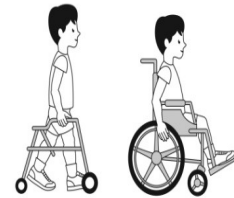
GMFCS Level I

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



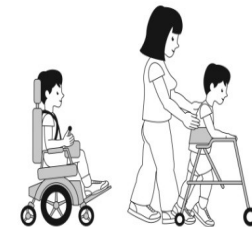
GMFCS Level II

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.



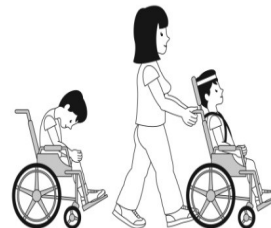
GMFCS Level III

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

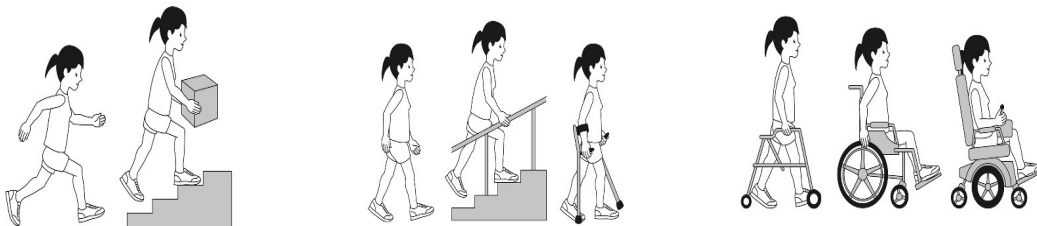
Children use methods of mobility that require physical assistance or powered mobility in most settings. They may walk for short distances at home with physical assistance or use powered mobility or a body support walker when positioned. At school, outdoors and in the community children are transported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



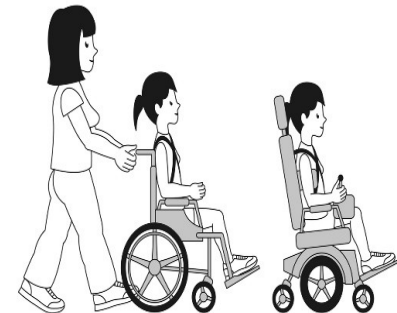
GMFCS Level V

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.

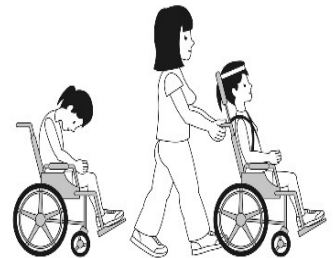
Gait Correction Surgery: Aims



Aim of surgery in non-walkers



Aim of orthopaedic surgery



CLINICAL EXAMINATION

MUSCLE STRENGTH

- **MEDICAL RESEARCH COUNCIL SCORE (0-5)**
- **MMT- KENDAL SCALE- (10-0)**

MUSCLE TONE

- **MODIFIED ASHWORTH**
- **TARDIEU**

SELECTIVE MUSCLE CONTROL

- **0 – No ability to isolate**
- **1 – Partial ability**
- **2 - Complete ability**

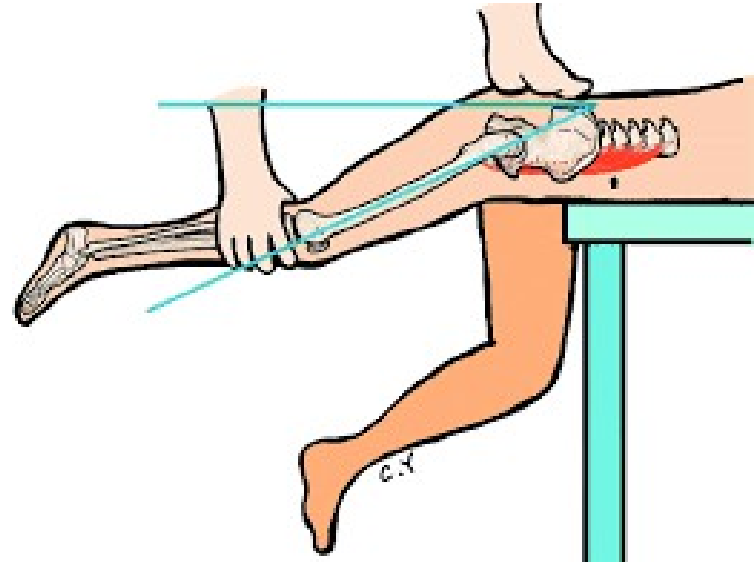
ROM AND JOINT CONTRACTURE

- **THOMAS TEST**
- **STAHELI PRONE EXTENSION TEST**
- **DUNCAN ELY**
- **PHELP'S TEST**
- **POPLITIAL ANGLE TEST**
- **DOUBLE POPLITIAL ANGLE**
- **HAMSTRING SHIFT**

HIP



 Assessment



Phelp's Test

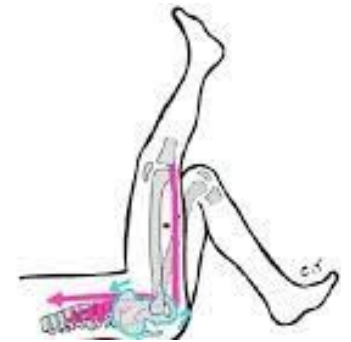
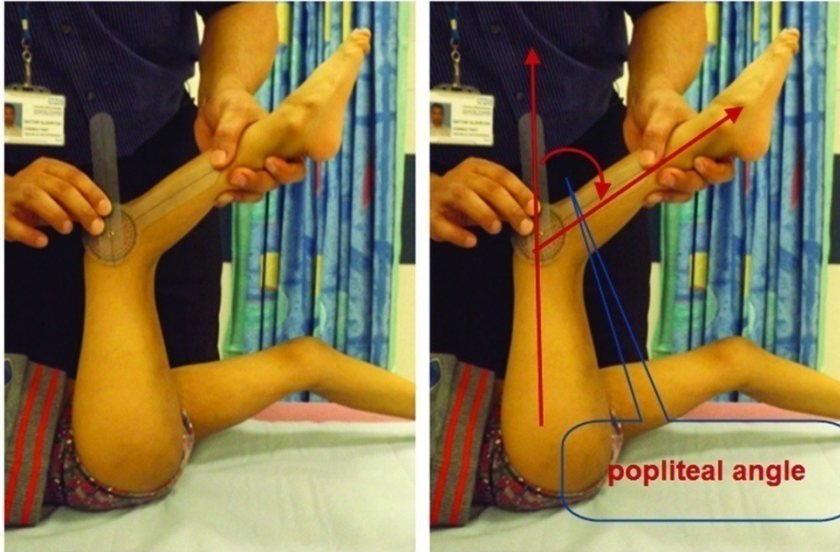


 Assessment

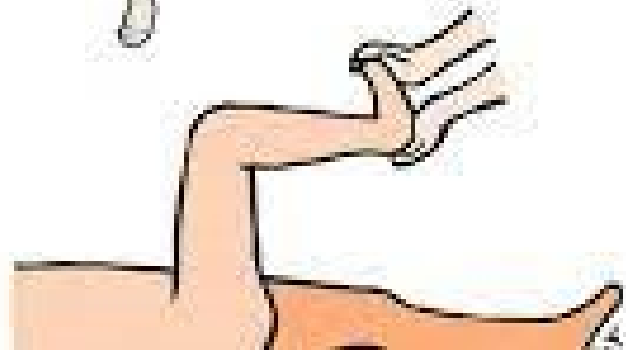
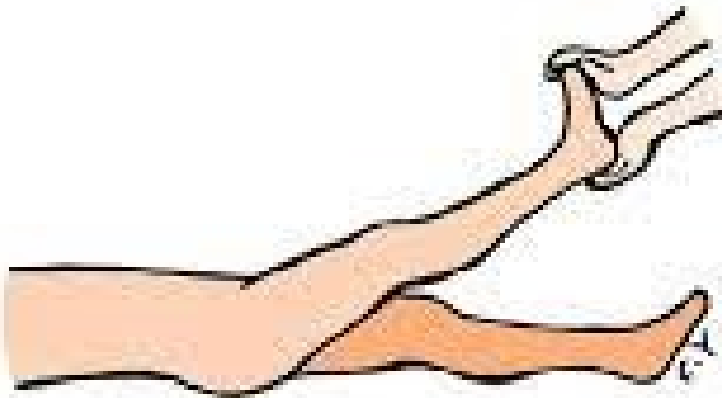


 Assessment

KNEE



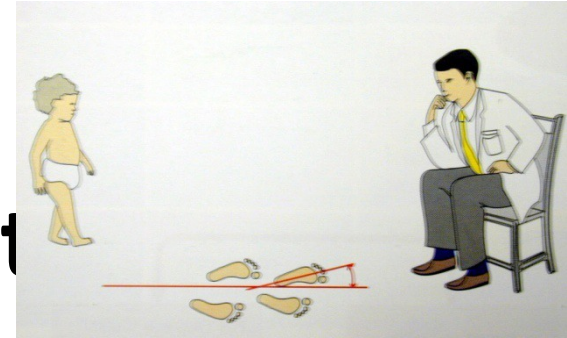
ANKLE



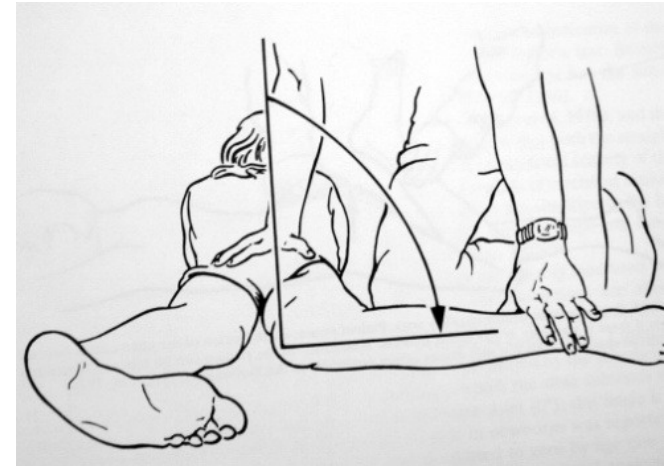
LEVER ARM DYSFUNCTION

- **Craig's/ Trochanteric prominence test**
- **Thigh foot angle**
- **Bimalleolar axis**
- **Second toe test**

Clinical Assessment Rotational Profile



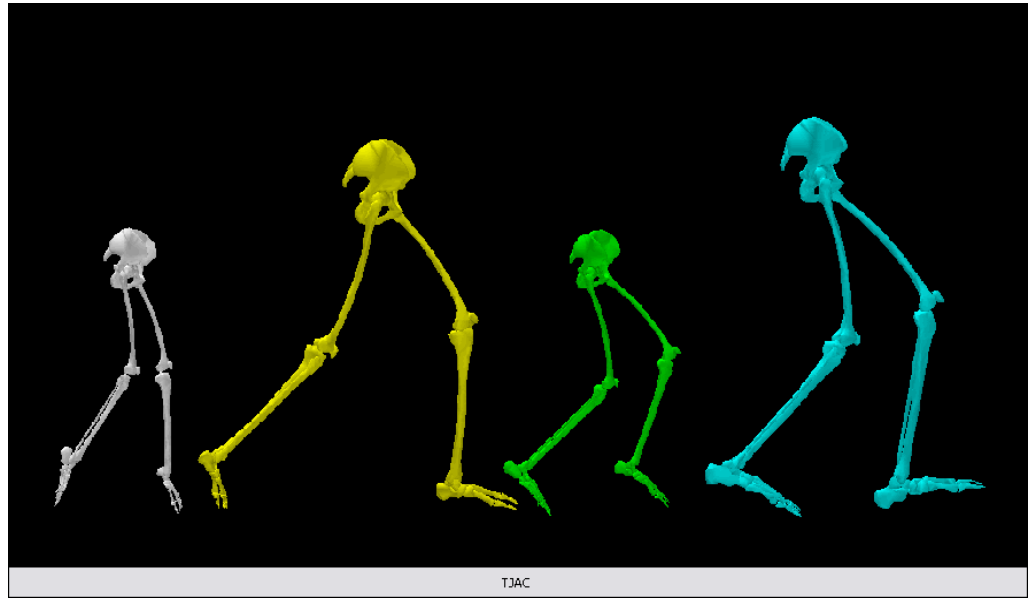
- **Foot propagation angle**
- **Femoral rotation**
int. / extr.
Rotation
- **Tibial rotation**
Foot – Thigh Angle



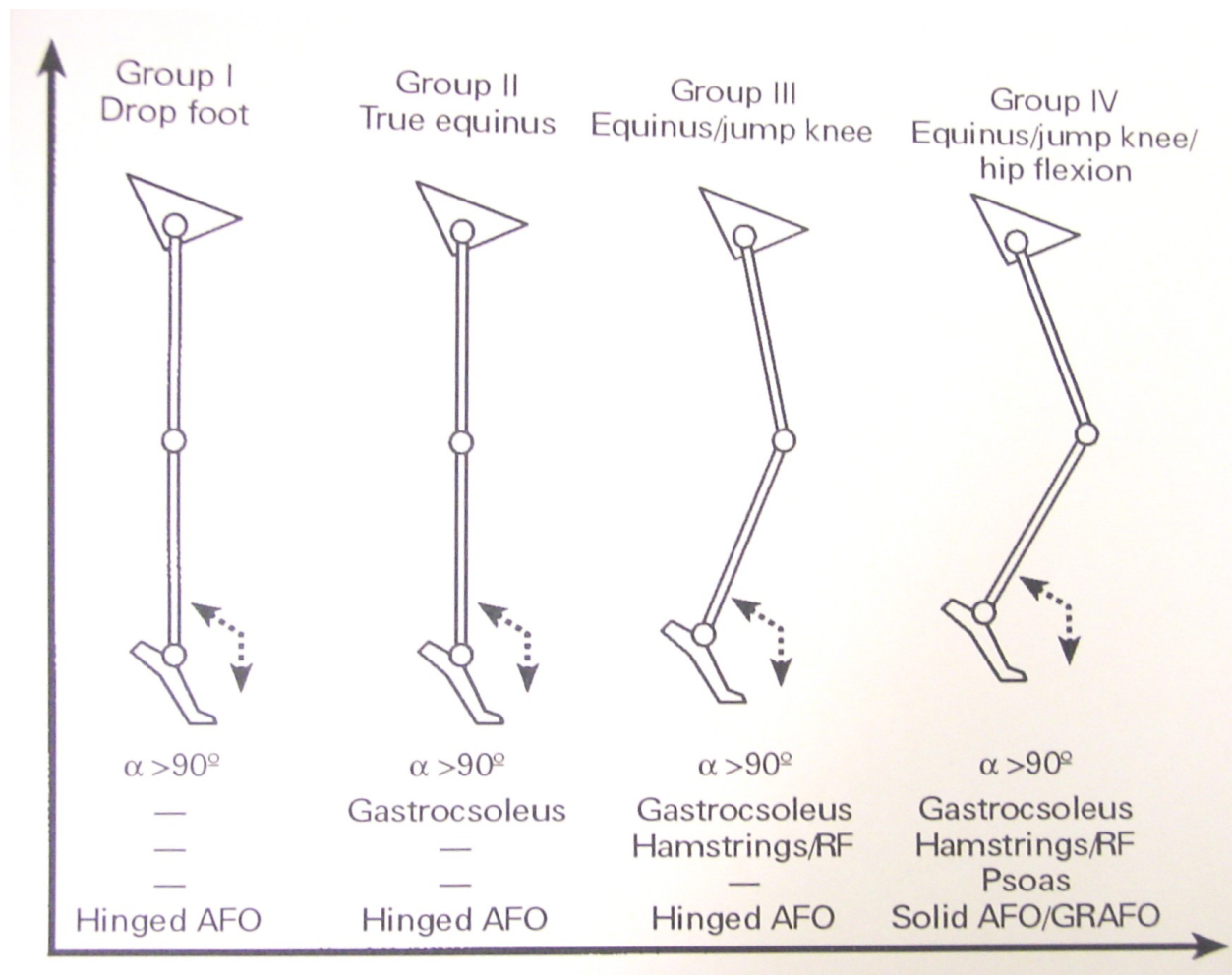
GAIT ANALYSIS

Gait Biomechanics

- **Observational gait analysis**
- **Video gait analysis**
- **Gait Laboratory**



Abnormal Gait Patterns in Hemiplegics

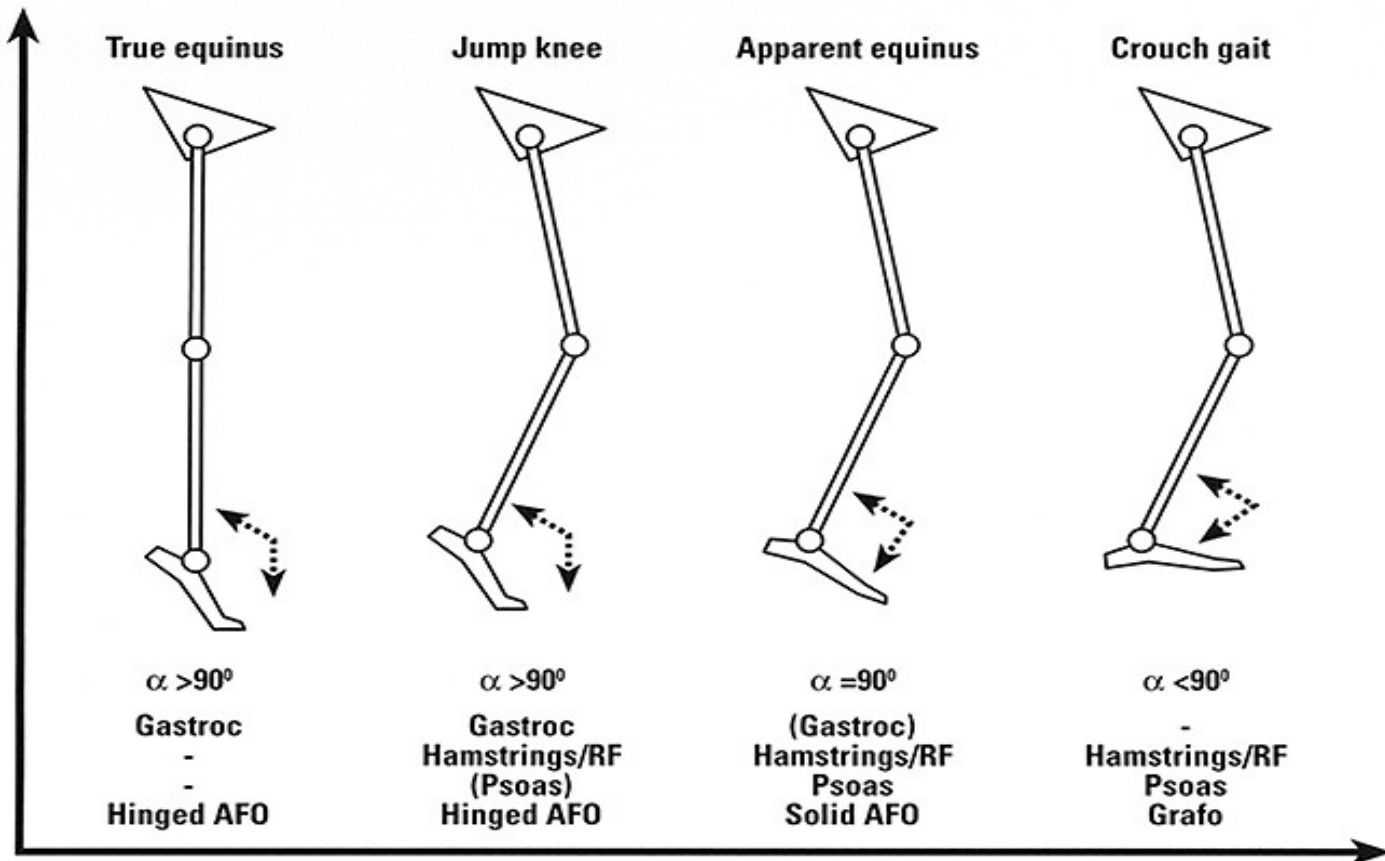


Winters, Gage & Hicks. JBS 69A; 1987

Abnormal Gait Patterns

Diplegics

Common Gait Patterns: Spastic Diplegia



HIP DISLOCATION

- **CHAA**
- **Reimer's Migration Percentage**

GMFCS III,IV.V

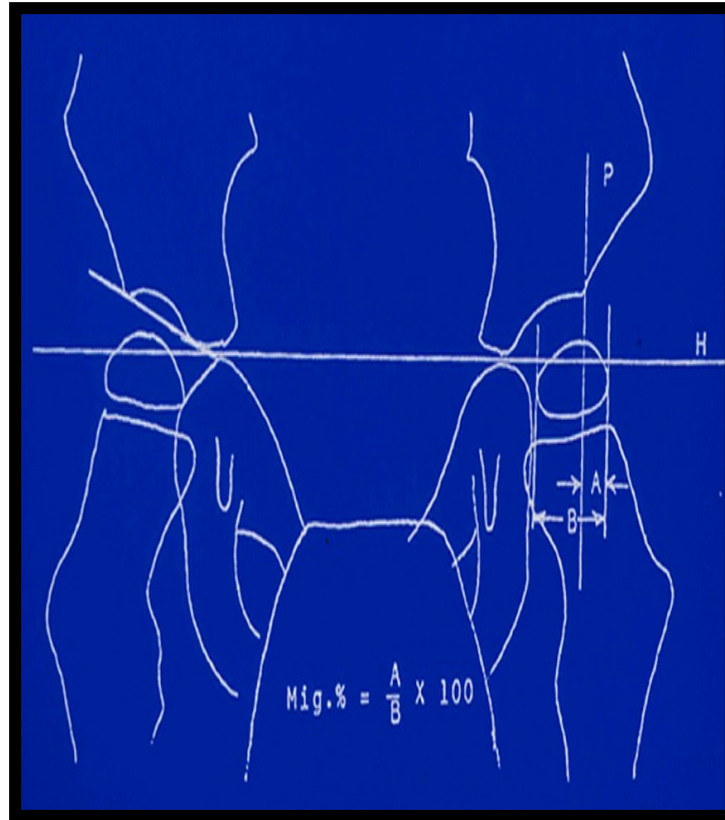


HIP DISLOCATION





AI

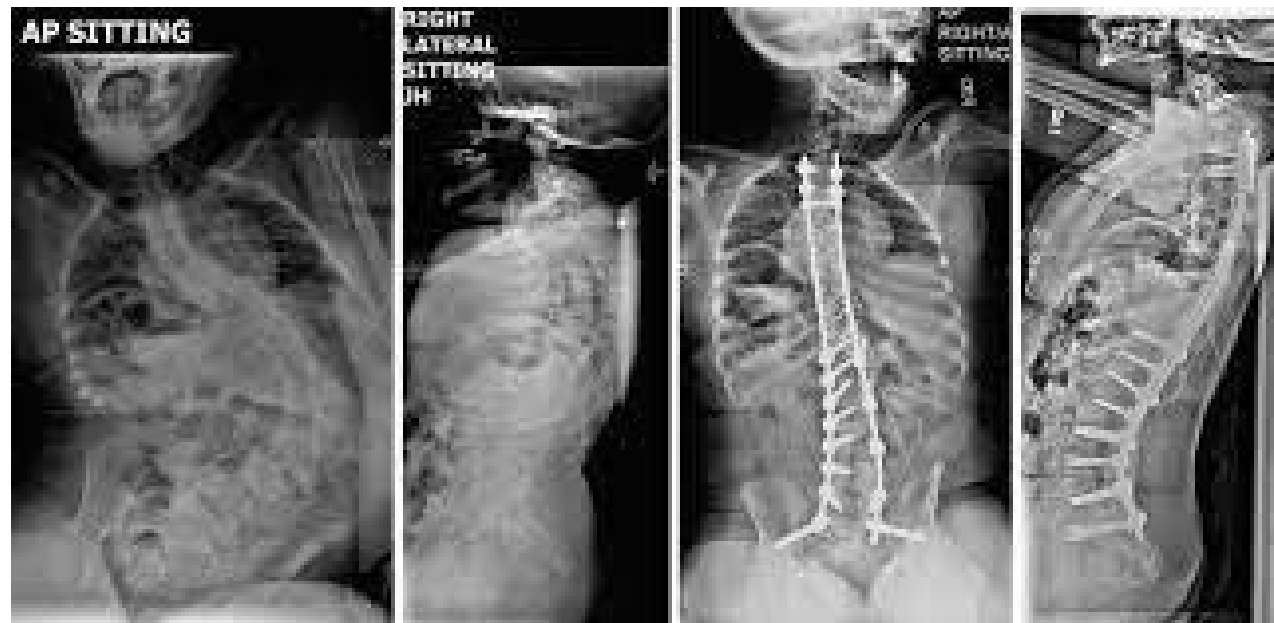


MP

Hip
Surveillance

SPINE DEFORMITY

- **Clinical**
- **X ray**



Functional Mobility Scale

FUNCTIONAL MOBILITY SCALE

- Exercise
- Household
- Community



Developed by the
Hugh Williamson Gait Laboratory
The Royal Children's Hospital
Melbourne, Australia
Part of the Gait CCRE
www.rch.org.au/gait



Rating **6**



Independent on all surfaces:
Does not use any walking aids or need any help from another person when walking over all surfaces including uneven ground, curbs etc. and in a crowded environment.

Rating **5**



Independent on level surfaces:
Does not use walking aids or need help from another person.* Requires a rail for stairs.
*If uses furniture, walls, fences, shop fronts for support, please see 4 in the appropriate description.

Rating **4**



Uses sticks (one or two):
Without help from another person.

Walking distance	Rating: select the number (from 1-6) which best describes current function
5 metres (yard)	
50 metres (yard)	
500 metres (yard)	

Rating **3**



Uses crutches:
Without help from another person.

Rating **2**



Uses a walker or frame:
Without help from another person.

Rating **1**



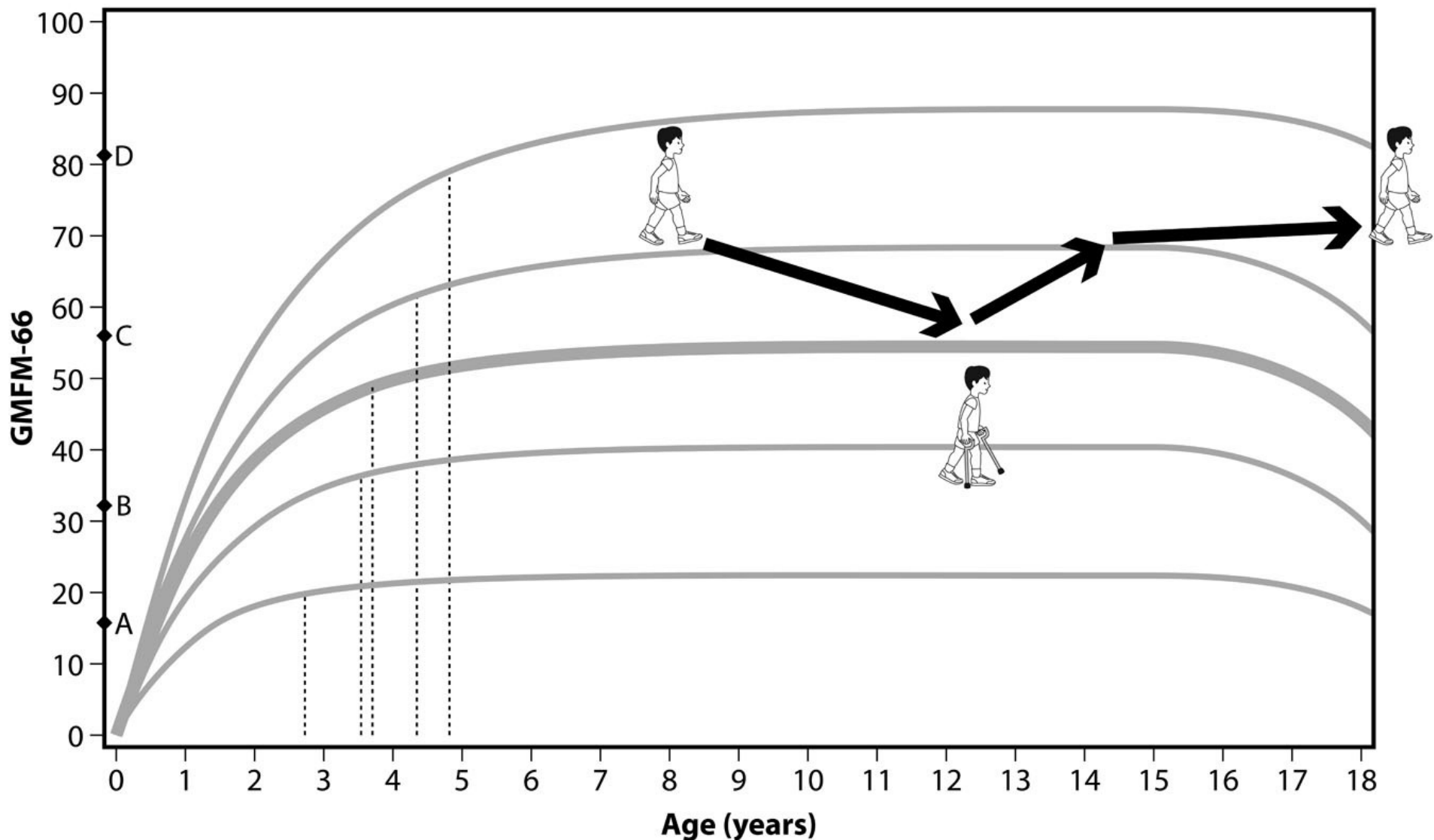
Uses wheelchair:
May stand for transfers, may do some stepping supported by another person or using a subframe.

Rating **C** **Crawling:**
Child crawls for mobility at home (5m).

Rating **N** **N = does not apply:**
For example child does not complete the distance (500 m).

The goal of management in CP is to maintain a child on their appropriate curve

Don't fall off the curve!



Team effort



**GYNAECOLOGIS
T**

PAEDITRICIAN

EARLY

**INTERVENTION
SPECIALIST**

OT

PT

P&O

Thank you

