



Paediatric
Musculoskeletal
Matters

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The limping child



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The child with a limp: a symptom and not a diagnosis

Eve Smith,¹ Mark Anderson,² Helen Foster^{1,3}

Arch Dis Child Educ Pract Ed 2012;97:185-193

Why is this topic important?

- Limp is a common presentation
 - Spectrum of causes from benign to serious
- Diagnosis needs careful clinical assessment
 - Doctors report low self-confidence in musculoskeletal clinical skills*
- Delay in diagnosis is common**
 - Delay in diagnosis has adverse effect on outcome

**Jandial 2009, *Lanyon 2004, Glazier 2004, Bond 2007, Hergenroder 2009*

***Foster 2007, 2010, Rapley 2013*

Objectives

- Define limp
- Describe the spectrum of causes
- Describe an approach to assessment
- Red flags and Pitfalls



What is limp ?

- Antalgic (painful) gait
 - Acute (1-2 days)
 - Chronic (> 6/52)*
 - Sub-acute
- Abnormal gait patterns (usually not acute)
 - Neurological



Causes of limp

- Classification by anatomy
- Classification by pathology
- Classification by age



Causes of limp

- Classification by anatomy
 - Skin / Soft tissue
 - Muscle
 - Joint
 - Bone
 - Referred
- Classification by pathology
 - Trauma
 - Infection
 - Malignancy
 - Inflammatory
 - Congenital
 - Psychosocial



Causes of limp

Table 1 Common and significant causes of limp by age²

	0–3 years	4–10 years	11–16 years
In all patients consider	Osteomyelitis/septic arthritis * Non-accidental injury * Testicular torsion/inguinal hernia/appendicitis/urine infection Juvenile idiopathic arthritis Metabolic conditions (eg, rickets) Haematological disease (eg, sickle cell anaemia)		
Age-dependent differential diagnoses to consider	Toddler's fracture Developmental dysplasia of the hip Neuroblastoma *	Transient synovitis Perthes' disease Acute lymphocytic leukaemia *	Slipped upper femoral epiphysis Primary bone tumours * Osgood–Schlatter disease, Sinding–Larsen syndrome



“Red flags”

- Potential life threatening
 - **Malignancy**
 - **Infection**
 - **Non accidental injury**
- Systemic upset (fever, malaise, weight loss, sweats, anorexia)
- Bone pain / joint pain
- Refractory or unremitting pain / Persistent night waking
- Red hot joint
- Incongruent history / pattern of injury



Child with limp > 3 weeks....

**If not trauma, and not septic, and
not malignancy, then
Juvenile Idiopathic Arthritis (JIA)
most likely**



Acute limp

- If non-weight bearing, then infection, trauma and malignancy are more likely
 - Also need to consider orthopaedic hip pathology
- Urgent referral needed
 - The very young (< 3 yrs)
 - Ill and febrile, painful joint restriction
 - Non-weight bearing, Immunosuppressed
- Clinical assessment
 - Assess for red flags
 - Investigations



Clinical assessment

- General examination
 - Vital signs
 - Check for pallor, bruising, lymph nodes
 - Check for rashes (exanthems, insect bites)
 - Abdominal exam (testes in boys) / hernia sites
 - Lower limb neurological exam
 - Pattern of injury (?NAI)
- Musculoskeletal examination
 - pREMS (Look, Feel, Move, Function, Measure) starting with obvious affected limb or joints
 - Cover all lower limb joints and spine, Gait
 - Footwear / soles of feet (!!)
 - pGALS to assess for joint involvement elsewhere to aid differential diagnosis



An evidence based approach to musculoskeletal examination

pGALS

- Basic musculoskeletal examination
- Discerns normal from abnormal
- Helps focus detailed joint exam

pREMS

- Detailed musculoskeletal examination
- Look, Feel, Move, Function, Measure approach

pGALS - paediatric Gait, Arms, Legs and Spine

pREMS - paediatric Regional Examination of the Musculoskeletal System

Acute limp - Investigations

- FBC (film), ESR, CRP, Ferritin
 - WCC can be normal in early sepsis
 - CRP tends to be higher before ESR in sepsis
 - Film can be normal in malignancy
 - High ferritin (lymphoma, systemic JIA, MAS)
 - +/- bone marrow / urine catecholamines
- Infection screen (blood / urine), ASOT, Lyme, LDH
- Imaging
 - Radiographs (frog views) / Ultrasound
 - +/- MRI / CT / Bone scan



Sub-acute limp

- Irritable hip is typical presentation
 - Transient synovitis common
 - Septic arthritis / osteomyelitis to be excluded
 - Infection less likely if child well



Transient synovitis or septic arthritis

Box 2 Kocher's criteria to differentiate between septic arthritis and transient synovitis in the presence of confirmed hip effusion⁹

Factors

- Fever $>38^{\circ}\text{C}$
- Unable to weight bear
- Erythrocyte sedimentation rate >40 mm/h
- Serum white cell count $>12 \times 10^6/\text{l}$

Probability of septic arthritis

- No factors present $<0.2\%$
- Two factors present 40%
- Three factors present 93%
- Four factors present $>99\%$

Sub-acute limp

- Irritable hip is typical presentation
 - Transient synovitis common
 - Septic arthritis / osteomyelitis to be excluded
 - Infection less likely if child well
- Consider unusual infections / presentations if immunosuppressed (TB, fungal)



Infection and the immunosuppressed

- Children with rheumatic disease*
 - Methotrexate / biologics / steroids
 - Red flags may be absent
 - Child may not be systemically unwell
 - Beware “the single joint flare”
 - Consider mycobacterial / atypical infection



Sub-acute limp

- Irritable hip is typical presentation
 - Transient synovitis common
 - Septic arthritis / osteomyelitis to be excluded
 - Infection less likely if child well
- Consider unusual infections if immunosuppressed (TB, fungal)
 - If persistent, consider Perthes' disease or Slipped Upper Femoral Epiphysis in older child



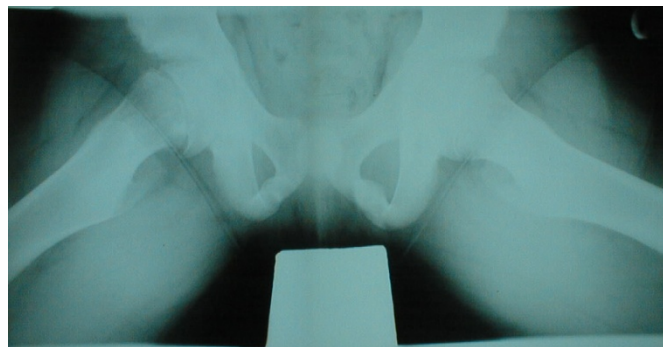
Legg-Calve-Perthes disease

- 5-10 years, boys > girls
- Presents with limp
 - Can be acute or chronic
- Hip pain
 - Or knee pain (referred)
 - Limited internal rotation
- Mostly unilateral
 - Bilateral $\leq 20\%$
- Can co-exist with other pathologies (eg JIA)



Slipped Capital Femoral Epiphysis

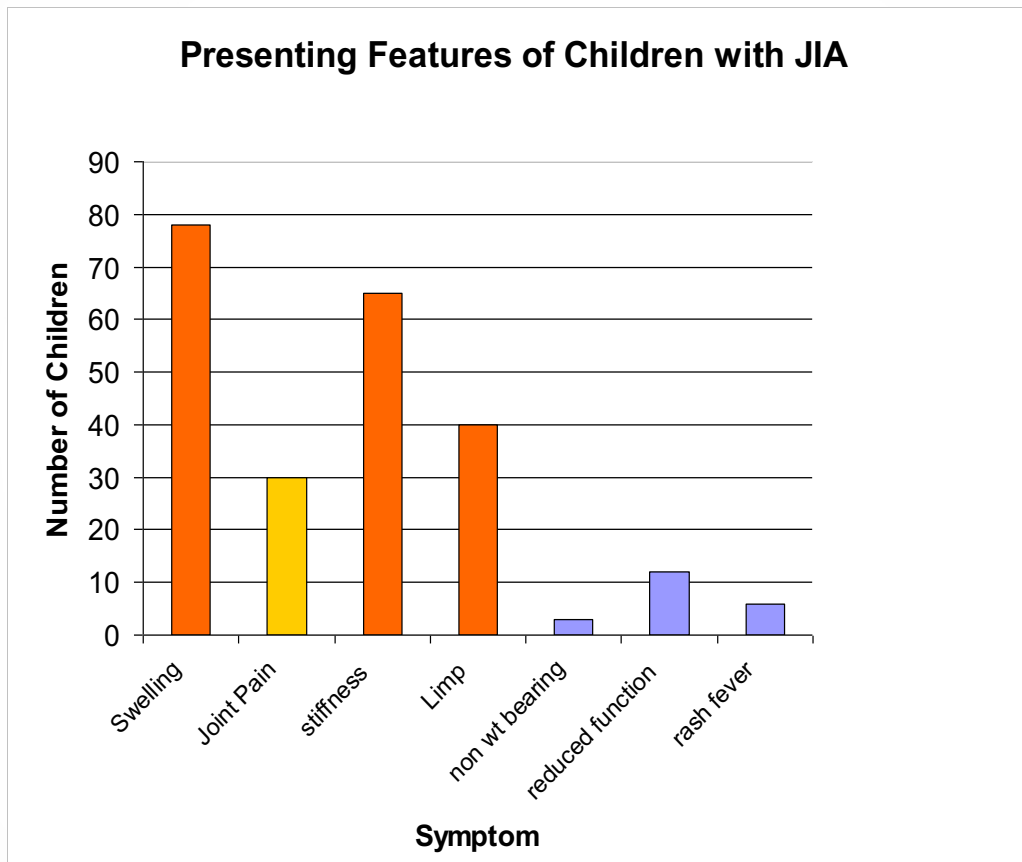
- Older children (10 - 16, males>females)
 - Risk factors include: overweight, Down's syndrome, hypothyroidism
 - Can co-exist with other conditions (eg JIA)
- Limp, hip (or knee pain) - can be acute or acute on chronic
- Request 'frog views' at x-ray to aid diagnosis
- Bilateral slip in 20%
- Risk of avascular necrosis if not treated promptly



Chronic intermittent limp

- Consider inflammatory joint/muscle disease
- Patients need review / safety net
- Consider paediatric rheumatology opinion
 - Before pursuing invasive tests
 - Don't delay awaiting investigations
 - Don't be put off diagnosis of inflammatory joint or muscle disease if bloods are normal (they often are !!)





McGhee JL et al. Identifying children with chronic arthritis based on chief complaints
Pediatrics 2002;110:354-9



Presentation of inflammatory musculoskeletal disease in children

- Limp
- Sore joint(s)
- Swollen joint(s)
- Limited movement
- Painful muscles
- Morning stiffness
- Muscle weakness

“Non-musculoskeletal”

- *Fever without focus*
- *Abdominal pain*
- *School refusal*
- *Change in behaviour*
- *Deteriorating mobility*
- *Deteriorating school work*
- ***Regression of milestones***
- *“Clumsy”*
- *Rash, ‘unwell child’*

History may be vague – need to be able to screen all joints
Goff et al 2012 ACDC

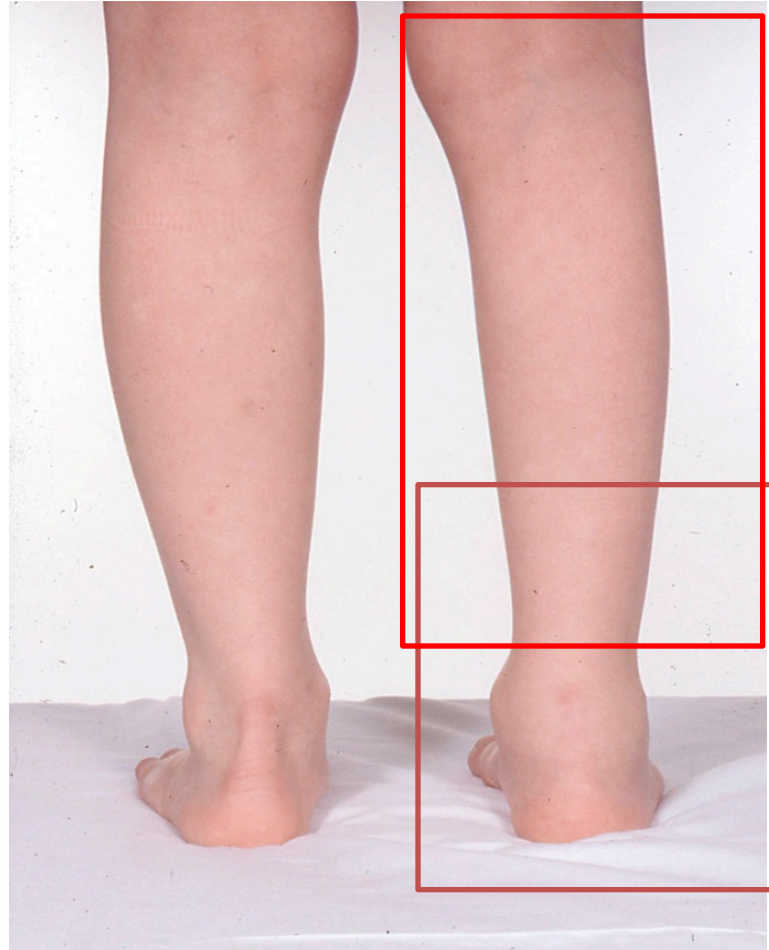
Worth looking elsewhere....
screening all joints and for other clues



Loss of range *(caution with symmetrical loss)*



Wasting suggests chronicity



Juvenile Idiopathic Arthritis

- 1 in 1000 (similar to epilepsy, diabetes)
- Several subtypes
- Commonest (60%)
 - “Oligoarticular JIA” - knee / ankle most common
 - Young (Preschool) (girls>boys)
 - **FBC, ESR & X-rays often normal**
 - **Often a well child / intermittent limp**
- Often mislabelled as growing pains*
 - Physical signs often subtle / missed
- Early aggressive treatment advocated
 - Joint injections, methotrexate, biological agents
- Generally good prognosis with early referral and treatment



*Rapley T, Foster HE. Access to care in JIA (in preparation)

Chronic anterior uveitis



1/3 of children with JIA
Potentially blinding
Asymptomatic in early stages



Regular eye screening for
many years is needed



Indicators of Inflammatory joint disease

- “Pain” may be absent / mild
 - “irritable”, poor sleeping especially young child
- Reduced function / avoiding activities
 - School / handwriting, play / sports
 - Regression of achieved motor milestones
- “Gelling” rather than morning stiffness
 - Car rides, sitting at school
- Signs of arthritis
 - Joint Swelling, Limited joint movement, muscle wasting
 - Need to screen **all** joints
 - Can be subtle and seemingly painless changes
 - Intermittent limp
- ***Don't be reassured by a well child and normal FBC, ESR, or negative rheumatoid factor (!!!!)***
- ***Refer if the history sounds inflammatory, even if exam seems normal and bloods are normal***

Developmental dysplasia of hip

- May be missed from baby checks
- Asymmetry, leg length discrepancy
- Limited internal rotation of hip, chronic limp
- Delayed walking



Solid tumours

- Rare but important
- Consider in differential of adolescent with knee pain
- Osteosarcoma, Ewings
 - **Distal thigh, proximal tibia most common**
- Bone pain, night pain
- May be co-existent arthritis
- Consider in the limping child
- May be unwell (red flags)

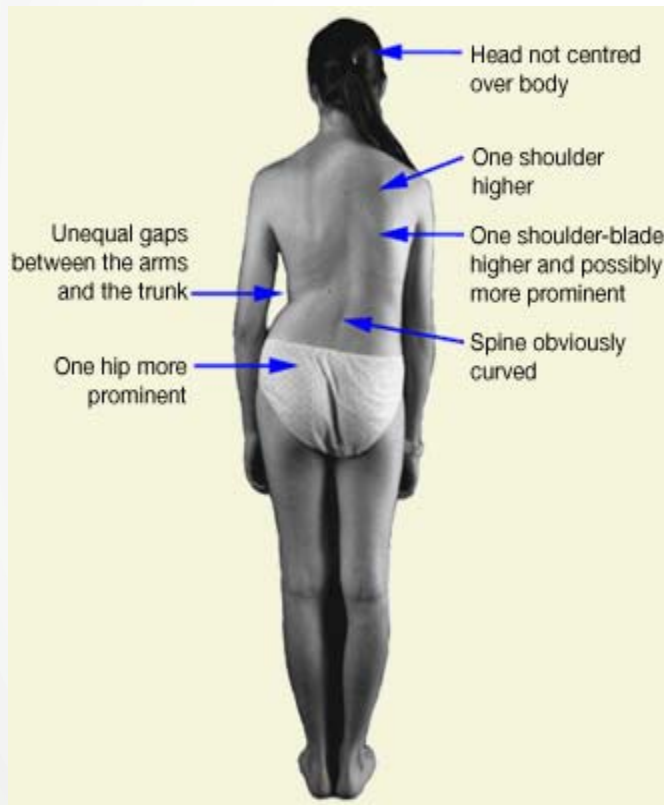


- Osteoid osteoma



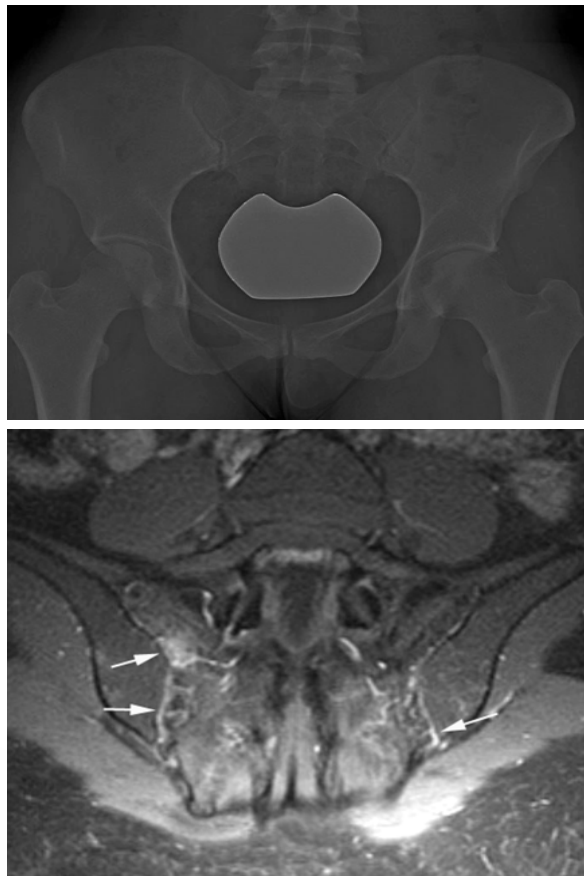
Spinal causes of limp

Scoliosis



+/- Leg length discrepancy

Sacro-iliitis



Tumour / Abscess



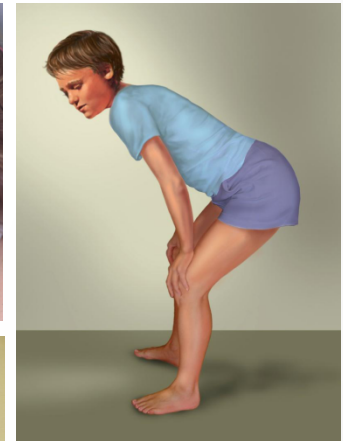
Muscle disease

Juvenile Dermatomyositis

- Can be indolent
- Problems with stairs
- Regression of motor milestones
- Pain, fatigue, **limp**, rash
- +/- Systemic involvement
- *Proximal weakness / Cannot jump !*

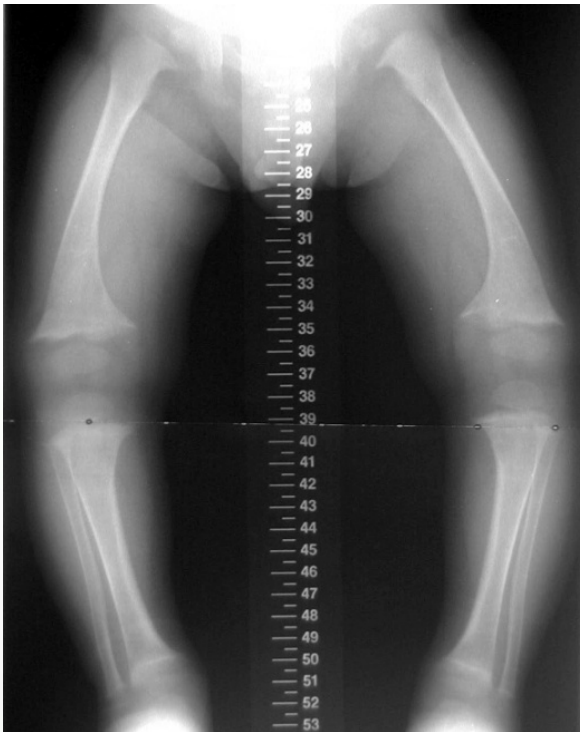
Contrast to muscular dystrophies

- Delay in motor milestones
- May be family history
- Boys affected mostly
- *Proximal weakness / cannot jump !*



Rickets / Osteomalacia

- Risk factors - ethnicity, vegan, malabsorption
- Limping, Failure to thrive, irritable, widespread pain, joint swelling, proximal weakness, waddling gait, dentition abnormalities



Growing pains

- Mum presents with Martin (aged 5)
- “Several weeks”
 - Painful legs (calves and shins)
 - 2-3 times per week
 - Wakes him at night – crying ++
 - Fine in the morning
- No limping, School full time
- Otherwise well
- Milestones normal
- Physical examination normal
 - flat feet noted

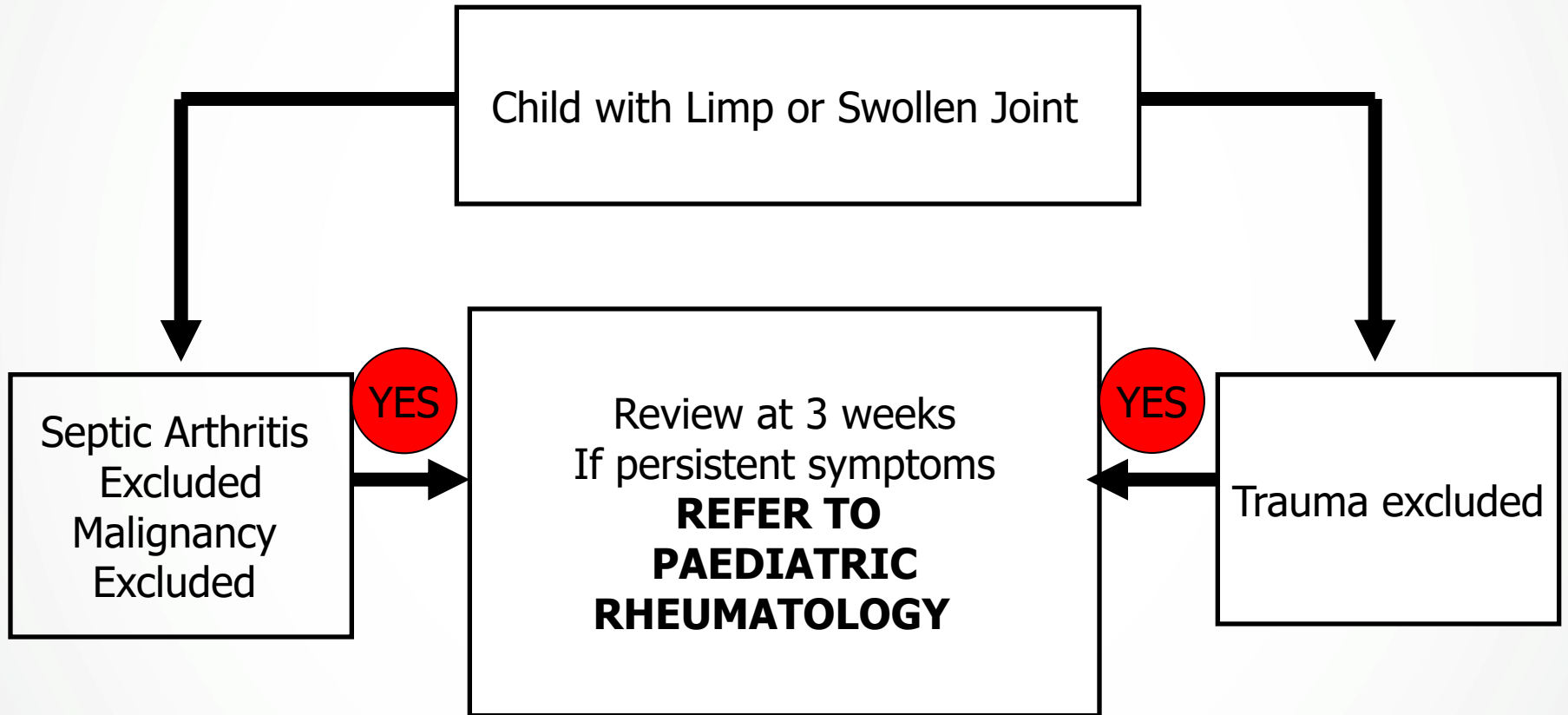
The “rules” of growing pains

- Age 4-12 yrs
- Bilateral (symmetrical)
- Never present in the morning
- Never limps
- Milestones normal
- History and examination normal (*Hypermobility*)

Pitfalls to be avoided

- **Limp is not a diagnosis** — do not discharge if not medically explained
- **Trauma is common** - may be a “red herring”
- Think beyond the hip !
- **Think about referred pain** (Abdomen, testes, spine, hip)
- Dual pathology can occur (eg SUFE in JIA)
- **Sepsis is easily masked in the immunosuppressed**
- Growing pains do not cause limp
- **Radiographs often normal in early sepsis / arthritis**
- Bloods tests (FBC, ESR, CRP) often normal and Rheumatoid factor usually negative in JIA
- **Normal variants are not painful and don't cause limp**

Who to refer ?



Persistent / intermittent limp – Investigations

- Full blood count (film)
- Acute phase reactants (ESR / CRP/ Ferritin)
- Radiographs / imaging
 - Hips (frog view), Above and below the joint (knee pain)
 - Ultrasound (MRI*, bone scan*)
- Consider
 - Muscles enzymes, Thyroid Function, Bone chemistry (Vit D)
 - Auto-antibodies - *interpret with caution – ANA / RF not diagnostic*
- ***DON'T DELAY REFERRAL WAITING FOR RESULTS***
- ***Don't be reassured by a well child and normal FBC, ESR, or negative rheumatoid factor (!!!!)***
- ***Refer if the history sounds inflammatory, even if exam seems normal and bloods are normal***

Conclusions

- Limp is not a diagnosis
- Trauma can be a red herring
- Broad spectrum of causes
- Careful clinical assessment paramount
- Investigations, if necessary, keep simple
- ***If concerned, refer (and please don't delay waiting for investigations) - early referral does make a difference...***

