

Lower Extremity Pain CLINICAL GUIDELINES for Workup

Definition

Lower extremity musculoskeletal pain is common, the possible etiologies are broad, ranging from benign to serious. The goal of this practice guideline is to present the tools for a provider to determine the diagnosis for a child with lower extremity pain in an efficient manner. This practice guideline is a reference for providers when caring for a patient with lower extremity musculoskeletal pain.

Signs and symptoms

The list of differential diagnoses' for lower extremity pain is extensive and broad. A thorough history and physical exam will aid the provider in identifying the correct diagnoses. Always be familiar with the child's medical history

Focused History of Musculoskeletal Pain

Timing of Pain

Timing can aid in diagnosis. Acute onset of symptoms suggests a more acute diagnosis such as septic arthritis, osteomyelitis, fracture, or malignancy. In contrast, morning symptoms that improve through the day are more suggestive of a rheumatologic etiology. Pain after activities is suggestive of an overuse syndrome or stress fracture. Night waking pain can be a benign etiology such as growing pains or more serious etiologies such as malignancy or osteoid osteoma. Identify any preceding activities and/or sports played surrounding the symptoms.

Sample questions:

- When did the pain start? What makes the pain better/worse? Rate pain on a scale
- Is the pain activity related?
- Is the pain bad enough to prevent the child from their activities, sports/play or school?
- How does the child feel after sports or play activities?
- Is the pain night waking versus in the AM or after naps?

Associated Systemic Features

Serious conditions will typically cause systemic symptoms. Be concerned by children who have stopped playing or teens who are limiting athletics or social activities.

Sample questions:

- Presence and time of fevers.
- Association with any rashes, weight loss, change in activity, decreased appetite, lethargy and/or a change in sleep patterns .

Nature & Location of Pain

Children are often better at demonstrating the location of the pain. In verbal children it may be beneficial ask them to use their index finger to identify the point of maximum tenderness.

Sample questions:

- Asking the patient to show them with their finger “the one pin point place that hurts the most, where would that be”?
 - If the child is unable to locate the area of maximum tenderness, ask them to draw a line with their finger demonstrating where the pain starts and stops. In non-verbal children, rely on the parent’s perceptions of where the pain is.
- Can you describe the pain? Where does the pain start/stop?

PHYSICAL EXAM

A thorough musculoskeletal examination is important for diagnosis. The focused musculoskeletal examination includes pediatric orthopaedic, neurologic and rheumatologic aspects. Always start with a presumed non-painful area, especially in small children, performing the examination of the painful area last. Musculoskeletal exam features

- Inspect and palpate both lower extremities
 - Identify the site of maximal tenderness
- Examine the joints for swelling and range of motion
- Evaluate range of motion to all upper and lower extremities including bilateral shoulders, elbows, wrists and fingers, hips, knees, ankles, and toes.
 - Be aware of the knee-hip-back triad. Often hip pain is referred to the knee. Back pain can refer to the hip or radicular pain from the spine will present with pain down the leg.
 - When evaluating knee pain always include evaluation of the hip.
- Include palpation of all extremities.
 - Assess for joint range limitation, warmth, and swelling.

Neuromuscular exam

- Evaluate the undressed child through several gait cycles pay attention to each limb and joint.
 - Running may help uncover subtle gait abnormalities.
 - To minimize the affected limb’s pain, the amount of time spent in the stance phase decreases and that spent in the swing phase increases (Barkin, Barkin & Barkin, 2000; Herring, 2007; Laine, Kaiser & Diab, 2010; Leet & Skaggs, 2000; Renshaw, 1995; Wyndam, 2007).
- Examine deep tendon reflexes, tone, clonus, sensation, straight leg raise, muscle wasting, evaluation of the feet and toes for clawing or deformity (Herring, 2007; Leet & Skaggs, 2000; Morrissy & Weinstein, 2006; Wenger & Rang, 1993).
 - A positive exam finding from above is suggestive of an etiology from either the spinal cord or a nerve root.

Causes

The etiology of musculoskeletal pain, with or without a limp, is broad. Below are commonly seen etiologies for musculoskeletal pain. The diagnoses can be grouped into the following categories:

- **Trauma:** (i.e. strains/sprains, fractures, dislocations)
- **Infection:** septic arthritis, osteomyelitis, brodie's abscess
- **Immune-mediated:** toxic synovitis, juvenile rheumatoid arthritis, Lyme disease, Strep reactive arthritis, osteoid osteoma
- **Acquired:** slipped capital femoral epiphysis (SCFE), Legg-Calve-Perthes disease
- **Neoplastic:** leukemia/lymphoma, Ewing's sarcoma, osteosarcoma
- **Referred:** discitis, psoas abscess, spine or hip pathology
- **Benign musculoskeletal:** Growing pains, tendonitis/apophysitis

Additional non-painful etiologies that can cause a limp to consider include:

- **Congenital:** developmental dysplasia of the hip
- **Non-painful limp:** leg length discrepancy, scoliosis
- **Neurologic:** cerebral palsy, myelomeningocele, or underlying neuromuscular pathology

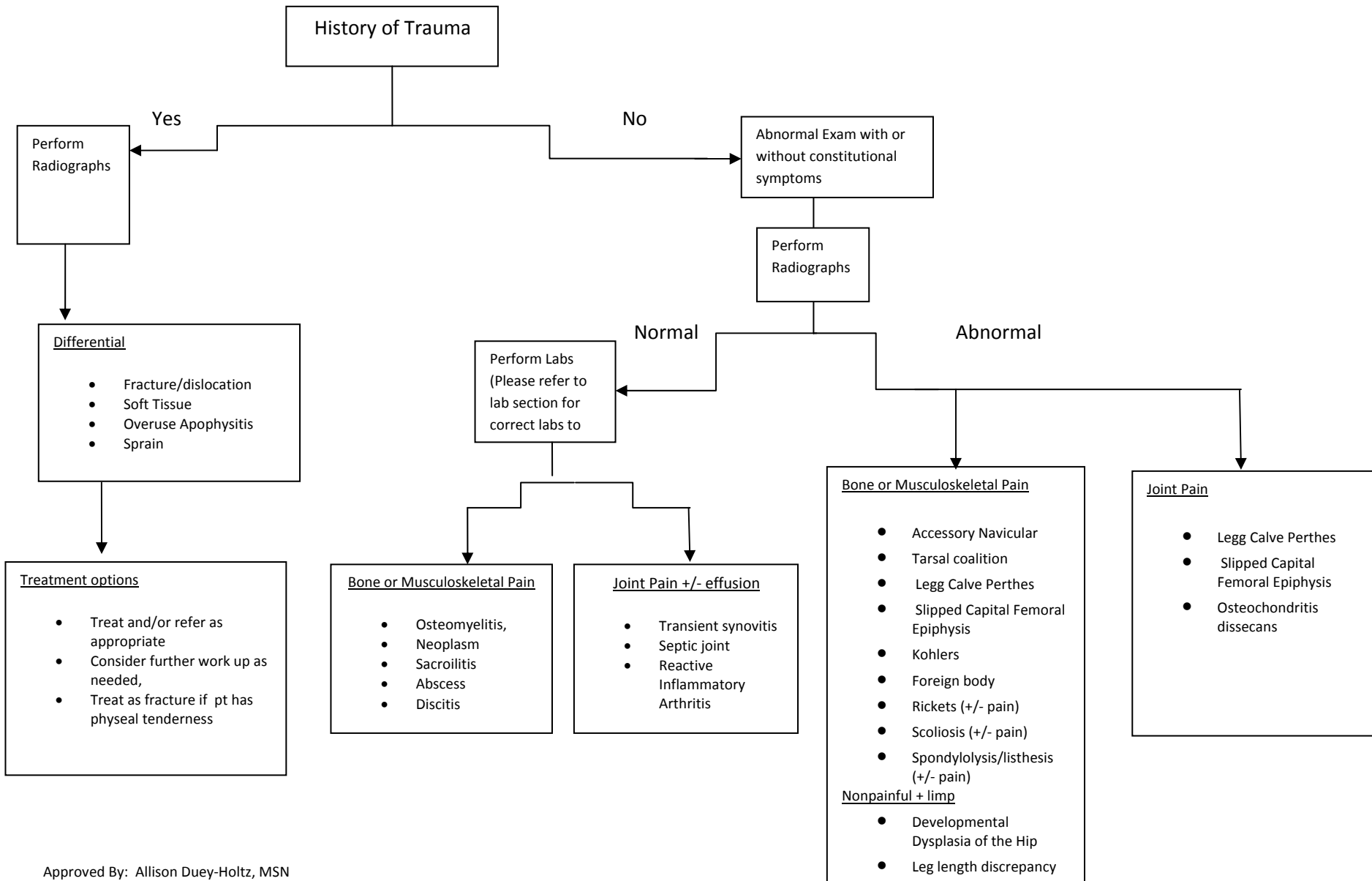
Risk Factors The vast majority of parents/care takers will identify a history of trauma for any source of musculoskeletal pain, especially in the young and non-verbal. Most often the etiology of musculoskeletal pain is related to accidental injury. However, it is important for a provider to always remember the vast number of other causes of musculoskeletal pain.

Complications While most musculoskeletal pain can be traced to a benign condition, one must remember infection and neoplastic processes can mimic many other diseases. The purpose of these guidelines is to provide the provider with the tools to work up patients with lower extremity pain in a timely manner, which in result will prevent further morbidity and medical complications

Recommendations for Providers considering referral to Pediatric Orthopaedic specialist

- Pre Work up

Work-up Algorithm



Imaging

Location of Pain	Radiographs	Views to Obtain	Other Imaging Tests
Hip	Pelvis	AP, frog, lateral	-MRI: Soft tissue and joints, large amounts of effusion; ex: stress fractures; infection; abscess; neoplasm; ligament injury; cartilage evaluation -CT: Boney abnormalities suspected but not definitive by x-ray, ex: intra-articular fracture -Ultrasound: Effusion of joints, vascular injuries suspected; ex: septic hip, infant DDH
Femur	Femur	AP, lateral	
Knee	Knee	AP, lateral, sunrise, notch	
Ankle	Tibia	AP, lateral	
	Ankle	AP, lateral, mortise	
Foot	Foot	AP, lateral, oblique	

Laboratory Tests

Test	Condition	Expected Finding
CBC	Infection	Elevated WBC & Platelets
	Inflammation	Elevated WBC & Platelets
	Malignancy	Cytopenia
CRP	Infection	Elevated
	Inflammation	Elevated
	Malignancy	Elevated
ESR	Infection	Elevated
	Inflammation	Elevated
	Malignancy	Elevated
ASO	Acute rheumatic fever	Markedly increased & usually very ill child
	Unresolved/undetected Group A hemolytic strep	Increased ASO, sore throat
AntiDNase B	Acute rheumatic fever	Positive & usually very ill child
	Unresolved/undetected Group A hemolytic strep	Positive

Test	Condition	Expected Finding
ANA	SLE	Markedly positive
	False positive	Mildly positive
Lyme	Lyme disease	Titer positive and Western Blot positive
	False positive titer (exposed but no disease)	
Synovial Cell Count	Septic arthritis	Turbid fluid; WBC >50,000 to over 100K, PMNS >75%
	Transient synovitis	Clear yellow synovial fluid; WBC 5, 000-15K, PMNs <25%
	JIA	25,000-100,000K
Blood Cx	Infection	+/- positive
Joint/Bone Cx	Infection	+/- positive
Stool Cx	Reactive arthritis with diarrhea	<i>Salmonella, Shigella, Yersinia, Campylobacter</i>
Urine Cx	Reactive arthritis	<i>Neisseria gonorrhoeae</i> or <i>Chlamydia</i>
Serum ferritin	Restless Leg Syndrome	Meet NIH RLS criteria Serum Ferritin < 50mcg

Adapted from Junnila & Cartwright, 2006a; Junnila & Cartwright, 2006b; Sawyer, J.R. & Kapoor, M. 2009, p. 220

Treatment and Referral of Pediatric Lower Extremity Pain

Musculoskeletal complaints most commonly are from diagnoses' treated by orthopedic and sports medicine providers. Occasionally, the underlying etiology causing musculoskeletal pain is from a problem not usually treated by orthopedic sub-specialists. Below are common conditions that present with lower extremity pain and/or limp. Included are initial interventions orthopedic providers implement.

Clinics at the CHW Orthopedic Center & Sports Medicine Program include:

Cerebral Palsy Clinic	Concussion	Fracture	General Orthopaedic
Scoliosis	Sports Medicine	Trauma	Well child lower extremity screening clinic

Clinic locations: Children's Hospital of Wisconsin-Main campus; CHW-Greenway; CHW-New Berlin (concussion only)

To schedule an appointment : Central Scheduling 414.607.5280 or toll free 877.607.5280

Orthopedic nurse line: 414.266.2513

Sports line 414.604.6512

Diagnosis	History, Physical and Test findings	Treatment and Referral
Accessory navicular	Medial foot pain + x-ray findings	<ul style="list-style-type: none"> conservative treatment with Non-steroidal anti-inflammatory drugs (NSAIDS) activity modification possible immobilization or orthosis referral to CHW Orthopedics or Sports Medicine with no improvement
Apophysitis/ musculoskeletal conditions: -Osgood- Schlatter -Patella femoral pain -Sindig-Larsen-Johanssen Syndrome -Severs	Tender to palpation over apophysis +/- x-ray findings	<ul style="list-style-type: none"> NSAIDS or Naproxen twice a day may consider short one to two week immobilization or bracing physical therapy (PT) 1-2 times per week for 6-8 weeks to include range of motion of affected joint(s), strengthening of lower extremities including hamstring/quadiceps/gluteus/calf muscles, with a return to sports program Local options: CHW main campus and CHW Green Sports Medicine Physical Therapy follow up in 6 weeks, consider referral to CHW Sports Medicine with no improvement of symptoms

Cerebral palsy	Neurology deficits with motor impairment Hypertonia Non painful limp	<ul style="list-style-type: none"> • Referral to CHW Multi Disciplinary Cerebral Palsy Clinic or CHW Physical Medicine and Rehabilitation
Complex regional pain syndrome	Pain after an injury, lower limb most common; pain to light touch that is disproportionate to mechanism of injury; evaluate for autonomic symptoms (skin temp different; color changes, absence of sweating)	<ul style="list-style-type: none"> • NSAIDS or Naproxen twice a day • begin PT for desensitization • discontinuation of any bracing • refer to CHW Pain & Palliative Care
Developmental dysplasia of hip	Check history for female, first born, breech, and family history. + Ortolani and Barlow, asymmetric thigh fold, + galeazzi, + klisic	<ul style="list-style-type: none"> • refer to CHW Pediatric Orthopedics with positive exam findings or imaging studies (ultrasound or x-ray)
Discitis	Back pain, +/-fever, decreased spinal motion, often systemic symptoms and systemically ill	<ul style="list-style-type: none"> • Referral to CHW emergency room • treat with IV antibiotic therapy with inpatient admission. • involvement of CHW orthopedics • consider LSO immobilization for pain control
Foreign Body	Possible history of foreign body, red, swollen, +/- x-ray findings	<ul style="list-style-type: none"> • remove of foreign body • antibiotic prophylaxis as needed • if surgical excision required referral to CHW general surgery or orthopedics if bone involvement
Fracture	Swelling/pain with motion/palpation: + x-ray findings: If tender over physis assume fracture	<ul style="list-style-type: none"> • splint and refer to CHW orthopaedics if non-displaced and closed fracture • urgent care or emergency department if open fracture, displacement, or angulation present

Gonococcal/ Chlamydial arthritis	+ Sexual activity; arthritis of one or more joints; sometimes accompanying dermatitis and systemic signs and symptoms; +/- positive nucleic acid amplification (NAAT) tests of synovial fluid, urine, vagina/cervix	<ul style="list-style-type: none"> involvement of local subspecialists as needed , (i.e. infectious disease and/or rheumatology), orthopaedics if septic joint I&D and antibiotic treatment if septic joint antibiotic treatment if aseptic joint and chlamydia likely plus pain management
Growing Pains	Late evening or night time lower extremity pains, usually bilateral, resolve with pain reliever/massage, not typically during day. X-rays negative/Labs negative	<ul style="list-style-type: none"> conservative management using symptomatic NSAIDS, massage, warmth, and other supportive measures until the syndrome resolves with time may try a course of PT with muscle stretching and exercise Restless Leg Syndrome may present as growing pains. Consider referral to CHW
Juvenile inflammatory arthritis	Morning pain, often multiple joint involvement, chronic, younger than sixteen, +/-CBC, ESR, ANA, AntiDNase B, ASO	<ul style="list-style-type: none"> symptomatic relief can be obtained with NSAIDS referral to a CHW Pediatric Rheumatology
Kohler's disease	Pain/swelling mid foot, limp, + x-ray findings navicular bone	<ul style="list-style-type: none"> restrict weight bearing and splint (ie prowalker consider refer to CHW orthopedics
Legg-Calve-Perthes disease	White males 4-10yo, hip and groin pain, decreased internal hip rotation, x-ray findings: flattening and fragmentation of femoral head	<ul style="list-style-type: none"> restrict activities and refer to CHW Orthopedics
Limb length discrepancy	+/-limp, not painful, + galeazzi, + AP leg length films	<ul style="list-style-type: none"> refer to CHW Orthopedics
Lyme Arthritis	Exposure to endemic area, +/-target rash, swelling/pain joints, +Lyme titer with +western blot,	<ul style="list-style-type: none"> refer to cdc.gov for most recent treatment guidelines OR refer to <i>Red Book: Report of the Committee on Infectious Disease</i> (most recent edition) involvement of local subspecialists as needed (i.e. infectious disease and/or rheumatology)

Neoplasm	Progressive or intermittent, deep seated, gnawing pain, often worse at night, +/- constitutional symptoms, +/- elevated labs, +/- x-ray findings	<ul style="list-style-type: none"> expedited referral to CHW/Froedert pediatric musculoskeletal tumor specialist or pediatric oncologist
Non accidental Trauma	Injury doesn't match story, child non-ambulatory with high suspicion fractures, + x-ray findings of affected area	<ul style="list-style-type: none"> treat injuries and begin further workup to evaluate for non accidental trauma based upon CHW facility guidelines admit to hospital for safety of patient and further work up
Osteochondritis dissecans	Pain +/- swelling affected joint, increase with activity, +/- catch/locking, + x-ray findings or older child/teen	<ul style="list-style-type: none"> treat initially with activity restrictions, immobilization, and non weight bearing to affected limb NSAIDS refer to CHW Sports Medicine
Osteomyelitis	Local tenderness/swelling bone, limp,+/- fever, elevated CBC, ESR, and CRP	<ul style="list-style-type: none"> refer to emergency room emergent
Restless Leg Syndrome	Sleep disturbance, normal physical exam, no systemic symptoms, meet NIH RLS guidelines criteria	<ul style="list-style-type: none"> Referral to pediatric sleep center
Rickets	No supplemental vitamin d, darker skin, genu varum and x-rays findings: widening/cupping of the metaphysis; abnormal labs	<ul style="list-style-type: none"> treatment of rickets by primary care provider with involvement of CHW endocrine team as needed refer to CHW Orthopedics for treatment of genu varum
Scoliosis	Thoracic/lumbar prominence on Adams forward bend test/ asymmetric shoulders/pelvis; Rarely painful; x-ray PA/lateral scoliosis shows scoliosis	<ul style="list-style-type: none"> refer to CHW Orthopedics-scoliosis/spine conditions clinic

Septic joint	Pain with joint motion, redness, swelling, warmth, restricted joint motion, non-weight bearing or limp, fever, elevated CBC, CRP, ESR +/-blood cultures	<ul style="list-style-type: none"> • emergent • ultrasound hip joints to evaluate for septic hip • refer CHW Emergency room septic joint work up protocol
Slipped Capital femoral epiphysis	Often seen 10-14yo teens, M>F, overweight, groin/knee pain, pain internal hip rotation, limp, + AP/frog lateral Pelvis x-ray	<ul style="list-style-type: none"> • emergent • strict non-weight bearing • refer to emergency room for surgical stabilization
Spondylolysis / Spondylolisthesis	Pain with back extension, AP/Lat/Oblique lumbar sacral spine films +/- findings	<ul style="list-style-type: none"> • refer to CHW Orthopedics-scoliosis/spine conditions clinic • NSAIDS as needed for pain • consider activity limitations until seen by subspecialty providers
Strain/sprain	Tender to palpation over soft tissue, +/- laxity, swelling, no significant pain with weight bearing	<ul style="list-style-type: none"> • NSAIDS • range of motion brace • begin ambulation as tolerated • refer to physical therapy if needed • refer to CHW Orthopedics with recurrent sprains
Tarsal coalition	Pain in foot with activity, often flat foot and restricted subtalar foot motion, +/- x-ray findings	<ul style="list-style-type: none"> • refer to CHW Orthopedics
Toxic synovitis	Mild pain with hip motion, ambulatory, afebrile, normal CBC, CRP, ESR Labs needs to be evaluated	<p>If ambulatory, afebrile, no constitutional symptoms, normal CBC, ESR, CRP, provider comfortable</p> <ul style="list-style-type: none"> • NSAIDS • follow up in 2 to 3 days • ambulation as tolerated • limit sports <p>If any of following symptoms refer to CHW Emergency for septic joint work up protocol</p> <ul style="list-style-type: none"> • Nonweightbearing • Febrile or constitutional symptoms • Moderate-severe pain • Elevated WBC, CRP or ESR

Adapted from Herring, J.A., (2007); Junnila, J.L. & Cartwright, V.W., (2006a); Sawyer, J.R. & Kapoor, M. 2009; Duey-Holtz et al (2012a), (2012b), (2012c)

Reference

- American Academy of Pediatrics. (2009). *Red Book: 2009 Report of the Committee on Infectious Diseases* (28th ed.). Elk Grove Village, IL: American Academy of Pediatrics.
- American Academy of Orthopaedic Surgeons. (2011). *Sprained Ankle*. Retrieved from <http://orthoinfo.aaos.org/topic.cfm?topic=A00150>
- Armstrong, K., Kohler, W.C., & Lilly, C.M. (2009). Managing sleep disorders: From A to Zzzz... *Contemporary Pediatrics*, 6(3), 28-35.
- Arthritis Foundation. (2009). *Diagnosis and disease process*. Retrieved from <http://www.arthritis.org/ja-diagnosis.php>
- Asadi-Pooya, A. A. & Bordbar, M.R. (2007). Are laboratory tests necessary in making the diagnosis of limb pains typical for growing pains in children? *Pediatrics International*, 39, 833-835.
- Ashwal, S., Russman, B.S., Blasco, P.A., Miller, G., Sandler, A., Shevell, M., & Stevenson, R. (2004). Practice parameter: diagnostic assessment of the child with cerebral palsy: report of the Quality Standards Subcommittee of the American Academy of Neurology and the Practice Committee of the Child Neurology Society. *Neurology*, 62, 851-863.
- Baron, R. & Janig, W. (2004). Complex regional pain syndromes-how do we escape the diagnostic trap?. *The Lancet*, 364, 1739-1741.
- Bass, A.M. & Levis, J.T. (2010). *Foreign body removal, wound*. Retrieved from <http://emedicine.medscape.com/article/1508207-overview>
- Beaty, J.H., & Kasser, J.R. (Eds.). (2001). *Rockwood and Wilkins' fractures in children, (5th ed.)*. Philadelphia, PA: Lippincott Williams & Wilkins.
- Canale, S.T., & Beaty, J.H. (Eds.). (2007). *Operative orthopedics, (11th ed.)*. Philadelphia, PA: Mosby.
- Carter, J.D., & Hudson, A.P. (2009). Reactive Arthritis: Clinical aspects and medical management. *Rheumatologic Diseases Clinics of North America*, 35, 21-44.
- Center for Disease Control. (2011). *Lyme disease*. Retrieved from <http://www.cdc.gov/lyme/>.
- Centers for Disease Control and Prevention. Sexually Transmitted Diseases Treatment Guidelines, 2010. *MMWR* 2010; 59 (No.RR-12): 53.
- Child Welfare Information Gateway. (2008). Child abuse. Retrieved from <http://www.childwelfare.gov/pubs/factsheets/signs.cfm>
- Child Welfare Information Gateway. (2007). Recognizing child abuse and neglect: Signs and symptoms. Retrieved from <http://www.childwelfare.gov/pubs/factsheets/signs.cfm>

- Cramer, K.E. & Scherl, S.A. (Eds.). (2004). *Orthopaedic surgery essentials: Pediatrics*. Philadelphia, PA: Lippincott Williams & Wilkins.
- Di Pietro, M.A., Brody, A.S., Cassady, C.I., Kleinman, P.K., Wyly, J.B., Applegate, K.E., & Seibert, J.J. (2009). AAP radiology position statement: Diagnostic imaging of child abuse. *Pediatrics*, 123(5), 1430-1435.
- Dodge, N.N. (2008). Cerebral Palsy: Medical Aspects. *Pediatric Clinic of North America*, 55, 1189-1207.
- Duey-Holtz, A.D., Collins, S.L, Hunt, L.B., Husske, A.M., Lange, A.M. (2012a). Acute and non-acute lower extremity pain in the pediatric population: Part I. *Journal of Pediatric Healthcare*, 26, (1), 62-68.
- Duey-Holtz, A.D., Collins, S.L, Hunt, L.B., Cromwell, P. F. (2012b). Acute and non-acute lower extremity pain in the pediatric population: Part II. *Journal of Pediatric Healthcare*, 26(3), 216-230.
- Duey-Holtz, A.D., Collins, S.L, Hunt, L.B., Cromwell, P. F. (2012c). Acute and non-acute lower extremity pain in the pediatric population: Part III. *Journal of Pediatric Healthcare* , in press.
- Evans, A. & Scutter, S. (2011). "Growing Pains": A critical review of the literature. Retrieved from <http://www.imbi.uni-freiburg.de/OJS/cca/index.php/cca/article/viewArticle/3740>
- Federico , D., Lynch, J.K., Jokl, P. (1990). Osteochondritis dissecans of the knee: A historical review of etiology and treatment . *Arthroscopy: The Journal of Arthroscopic and Related Surgery*, 6(3), 190-197.
- Gholve, P.A., Scher, D.M., Khakharia, S, Widmann, R.F., & Green, D.W. (2007). Osgood schlatter syndrome. *Current Opinion Pediatrics*. 19(1), 44.
- Hergenroeder, A.C. (2010). Causes of knee pain and injury in the young athlete. *Up to Date*. Retrieved from <http://www.uptodate.com/contents/causes-of-knee-pain-and-injury-in-the-young-athlete>
- Herring, J.A. (Ed.). (2008). *Tachjian's pediatric orthopaedics* (4th ed.). Philadelphia, PA: Lippincott Williams & Wilkins.
- Holmes, K.K., Sparling, P.R., Stamm, W.E., Piot, P., Wasserheit, J.N., Corey, L., Cohen, M., and Watts, D.H., editors. *Sexually Transmitted Diseases*, 4th edition. New York: McGraw-Hill Companies.
- Junnilla, J.L. & Cartwright, V.W. (2006). Chronic musculoskeletal pain in children. Part II: Rheumatic causes. *American Family Physician*, 74(2), 293-299.
- Kellog, N.D. & The Committee on Child Abuse & Neglect. (2007). Evaluation of suspected child physical abuse. *Pediatrics*, 9(6), 1232-1241.
- Kienstra, A.J. & Macias, C.G. (2011). *Slipped capital femoral epiphysis*. Retrieved from http://www.uptodate.com/contents/slipped-capitalfemoralepiphysis?source=search_result&selectedTitle=1%7E29

Kocher, M.S., Mandiga R., Murphy J.M., Goldmann, D., Harper, M., Sundel, R., Ecklund K., Kasser, J.R. (2003). A clinical practice guideline for treatment of septic arthritis in children: Efficacy in improving process of care and effect on outcome of septic arthritis of the hip. *Journal of Bone and Joint Surgery. American Volume*, 85-A(6), 994-999.

Levine, M.R., Gorman, S.M., Young, C.F., & Courtney, D.M. (2008). Clinical characteristics and management of wound foreign bodies in the ED. *American Journal of Emergency Medicine*, 26, 918-922.

Liu, C., Bayer, A., Cosgrove, S.E., Daum, R.S., Fridkin, S.K., Gorwitz, R.J., Levine, D.P. (2011). Clinical practice guidelines by the Infectious Diseases Society of America for the treatment of methicillin-resistant *staphylococcus aureus* infections in adults and children. *Clinical Infectious Diseases*, 52, 1-38.

Mathews, C.J., Kingsley, G., Field, M., Jones, A., Weston, A.C., Phillips, M., Walker, D., & Coakley, G. (2007). Management of septic arthritis: a systematic review. *Rheumatologic Disease*, 66, 440-445.

Mathison, D.J. & Agrawal, D. (2001). *General principles of fracture management: Fracture patterns and description in children*. Retrieved from <http://www.Uptodate.com/contents/general-principles-of-fracture-management-fracture-patterns>

Miller, G. (2011). *M.D. Diagnosis of cerebral palsy*. Retrieved from <http://www.uptodate.com/contents/diagnosis-of-cerebral-palsy>.

Misra, M., Pacaud, D., Petryk, A., Collett-Solberg, P.F., Kappy, M., on behalf of the Drug and Therapeutics Committee of the Lawson Wilkins Pediatric Endocrine Society. (2008). Vitamin D deficiency in children and its management: Review of current knowledge and recommendations. *Pediatrics*, 122(2), 398-417.

Morrisey, R.T., Weinstein, S.L. (Eds). (2006). *Lovell and Winter's Pediatric orthopaedics (6th ed)*. Philadelphia, PA: Lippincott Williams, and Wilkins.

Negrini, S., Grivas, T., Kotwicki, T., Rigo, M., Zaina, F. and the International Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT). (2009). Guidelines on "Standards of management of idiopathic scoliosis with corrective braces in everyday clinics and in clinical research": SOSORT Consensus 2008. *Scoliosis*, 4(2), 1-14.

Omey, M.L., Micheli, L.J. (1999). Foot and ankle problems in the young athlete. *Medicine and Science in Sports and Exercise*, 31, S470-S486.

Ondo, W.G. (2009). Restless legs syndrome. *Neurologic Clinics*, 27, 779-799.

Renshaw, T.S. & Deluca, P.A. (2006). Cerebral Palsy. In TR. Morrissy, & SL. Weinstein (Eds.), *Lovell and Winter's Pediatric Orthopaedics, 6th ed.* (pp. 593-594). Philadelphia, PA: Lippincott, Williams, and Wilkins.

Scoliosis Research Society (2011a). *Spondylolysis*. Retrieved from http://www.srs.org/patient_and_family/spondylolisthesis/index.htm

- Scoliosis Research Society (2011b). *Isthmic Spondylolisthesis*. Retrieved from http://www.srs.org/patient_and_family/spondylolisthesis/isthmic_spondylolisthesis.htm
- Sewell, M.D., Rosendahl, K., & Eastwood, D.M., (2009). Developmental dysplasia of the hip. *British Medical Journal*, 339, 1242-1248.
- Sherry, D.D. (2011). *Complex regional pain syndrome in children*. Retrieved from <http://www.uptodate.com/contents/complex-regional-pain-syndrome-in-children>
- Shereck, J.R. & Schwend, R.M. (2004). Infection. In: K.E. Cramer & S.A. Scherl (Eds.), *Orthopaedic surgery essentials: Pediatrics* (pp. 197). Philadelphia: Lippincott, Williams & Wilkins.
- Skaggs, D. & Flynn, J. (2005). *Staying out of trouble in pediatric orthopaedics*. Philadelphia, PA: Lippincott Williams & Wilkins.
- Skaggs, D.L., & Storer, S.K. (2006). Developmental dysplasia of the hip. *American Family Physician*, 74, 1310-1316.
- SOSORT guideline committee; Weiss, H.R., Negrini, S., Rigo, M., Kotwicki, T., Hawes, M.C., Grivas, T.B., Maruyama, T., & Landauer, F. (2006). Indications for conservative management of scoliosis (guidelines). *Scoliosis*, 1(5), 1-5.
- Staheli, L.T. (2006). *Practice of pediatric orthopaedics* (2nd ed.). Philadelphia, PA: Williams and Wilkins.
- Staheli, L.T. (2007). *Fundamentals of pediatric orthopaedics* (4th ed.). Philadelphia: Lippincott, Williams & Wilkins.
- Staheli, L.T. & Song, K.T. (2007). *Pediatric orthopaedic secrets* (3rd ed.). New York: Elsevier Health Sciences.
- Stanley, L.C. & Ward-Smith, P. (2011). The diagnosis and management of Juvenile Idiopathic Arthritis. *Journal of Pediatric Healthcare*, 25(3), 191-194.
- Stanton-Hicks, M., Baron, R, Gordh, T., Harden,N., Koltzenburg, M., Raj, P., & Wilder, R. (1998). Complex regional pain syndromes: Guidelines for therapy. *Clinical Journal of Pain*, 14, 155-166.
- Steere, A.C., Coburn, J., Glickstein, L. (2004). The emergence of Lyme disease. *Journal of Clinical Investigation*, 113(8), 1093-1011.
- Stoodley, N. (2002). Non-accidental head injury in children: gathering the evidence. *Lancet*, 360, 271-272.
- Sugar, N.F., Taylor, J.A., Feldman, K.W. (1999). Bruises in infants and toddlers: those who don't cruise rarely bruise. *Archives of Pediatric and Adolescent Medicine*, 153(4), 399-403.
- Sullivan, J.A., & Anderson, S.J. (Ed.). (2000). *Care of the young athlete*. Library of Congress: American Academy of Pediatrics and the American Academy of Orthopaedic Surgeons.

Thorpy, M. & National Heart, Lung, and Blood Institute Working Group on Restless Legs Syndrome (2004). *Medical Bulletin 2004: Restless leg syndrome*. Retrieved from <http://www.rls.org/literature/bulletin.html>.

Uziel, Y. & Hashkes, P.J. (2007). Review: Growing pains in children. *Pediatric Rheumatology*, 5(1), 1546-1550.

Wagner, C.L. & Greer, F.R. (2008). Prevention of rickets and vitamin D deficiency in infants, children, and adolescents. *Pediatrics*, 122(5), 1141-1152.

Walters, A.S., Picchietti, D.L., Ehrenberg, B.L., & Wagner, M.L. (1994). Case reports: Restless legs syndrome in childhood and adolescence. *Pediatric Neurology*, 11, 241-245.

Watters, WC., Bono, C., Gilbert, TD., Kreiner, S., Mazanec, D., Shaffer, WO., Baisden, J., Easa, J., Fernand, R., Ghiselli, G., Heggeness, M., Mendel, R., O'Neill, C., Reitman, C., Resnick, D., Summers, J., Timmons, R., Toton, J., & The North American Spine Society. (2008). Evidence-Based Clinical Guidelines for Multidisciplinary Spine Care, Diagnosis and Treatment of Degenerative Lumbar Spondylolisthesis. Retrieved from http://www.spine.org/Documents/spondylolisthesis_Clinical_Guideline.pdf

Wilder, R.T. (2006). Management of pediatric patients with complex regional pain syndrome. *Clinical Journal of Pain*, 22, 443-448.

Wormser, G.P., Dattwyler, R.J., Shapiro, E.D., Halperin, J.J., Steere, A.C., Klempner, M.S., Nadelman, R.B. (2006). The clinical assessment, treatment and prevention of lyme disease, human granulocytic anaplasmosis, and babesiosis: Clinical practice guidelines by the infectious diseases society of America. *Clinical Infectious Diseases*, 43, 1089-2134.