



Body System: Musculoskeletal		
Session Topic: Lower Extremity Musculoskeletal Exam Techniques		
Educational Format		Faculty Expertise Required
REQUIRED	Interactive Lecture	Expertise in the field of study. Experience teaching in the field of study is desired. Preferred experience with audience response systems (ARS). Utilizing polling questions and engaging the learners in Q&A during the final 15 minutes of the session are required.
OPTIONAL	Problem-Based Learning (PBL)	Expertise teaching highly interactive, small group learning environments. Case-based, with experience developing and teaching case scenarios for simulation labs preferred. Other workshop-oriented designs may be accommodated. A typical PBL room is set for 50-100 participants, with 7-8 each per round table. <u>Please describe your interest and plan for teaching a PBL on your proposal form.</u>
Professional Practice Gap	Learning Objective(s) that will close the gap and meet the need	Outcome Being Measured
<ul style="list-style-type: none"> Inadequacies in musculoskeletal education have previously been documented among medical students, residents, and attending physicians in a number of specialties. Physicians often have knowledge gaps with regard to appropriate application of Ottawa rules; proper examination skills; understanding which diagnostic imaging tests to order, and when to order them; establishing a standardized process for coordinating referrals; being aware of new, more effective tests; and improving surveillance of pathological findings. 	<ol style="list-style-type: none"> Distinguish musculoskeletal conditions that result from overuse/repetitive motion injuries in the lower extremities, with particular attention to those that occur in pediatric patients. Assess an injured patient's range of motion, stability, bone alignment, soft tissue swelling, palpable warmth or mass(es), pain or tenderness and crepitation in the lower extremities. Apply appropriate treatment strategies for patients with musculoskeletal injuries in the lower extremities that include pain management, application of the RICE strategy, casting, splinting, joint injection/ aspiration, dislocation reduction and/or emergency stabilization. Identify red flags from the physical examination of lower extremity injuries that warrant referral to a sub-specialist (e.g. surgery, physical therapy) or for diagnostic imaging. 	Learners will submit written commitment to change statements on the session evaluation, indicating how they plan to implement presented practice recommendations.
ACGME Core Competencies Addressed (select all that apply)		
X	Medical Knowledge	Patient Care



Interpersonal and Communication Skills	Practice-Based Learning and Improvement
Professionalism	Systems-Based Practice

Faculty Instructional Goals

Faculty play a vital role in assisting the AAFP to achieve its mission by providing high-quality, innovative education for physicians, residents and medical students that will encompass the art, science, evidence and socio-economics of family medicine and to support the pursuit of lifelong learning. By achieving the instructional goals provided, faculty will facilitate the application of new knowledge and skills gained by learners to practice, so that they may optimize care provided to their patients.

- Provide up to 3 evidence-based recommended practice changes that can be immediately implemented, at the conclusion of the session; including SORT taxonomy & reference citations
- Facilitate learner engagement during the session
- Address related practice barriers to foster optimal patient management
- Provide recommended journal resources and tools, during the session, from the American Family Physician (AFP), Family Practice Management (FPM), and Familydoctor.org patient resources; those listed in the References section below are a good place to start
 - Visit <http://www.aafp.org/journals> for additional resources
 - Visit <http://familydoctor.org> for patient education and resources
- Provide recommendations for utilizing evidence-based guidelines to determine the need for radiography of patients presenting with acute sprain in a lower extremity.
- Provide strategies for distinguishing musculoskeletal conditions that result from overuse/repetitive motion injuries to lower extremities, with particular attention to those that occur in pediatric patients.
- Provide recommendations for assessing a patient presenting with a lower extremity injury for range of motion, stability, bone alignment, soft tissue swelling, palpable warmth or mass (es), pain or tenderness and crepitation.
- Provide evidence-based recommendations for treating plantar fasciitis.
- Provide evidence-based recommendations for the treatment of grade 1-2 ankle strains.
- Provide evidence-based recommendations for the treatment of patellofemoral pain syndrome.
- Provide strategies and resources for developing collaborative care plans for patients with sprains, strains or dislocations of a lower extremity, emphasizing current evidence-based recommendations for pharmacologic and non-pharmacologic therapy.
- Provide recommendations regarding guidelines for Medicare reimbursement.
- Provide recommendations to maximize office efficiency and guideline adherence to the diagnosis and management of musculoskeletal injuries.
- Provide an overview of newly available treatments, including efficacy, safety, contraindications, and cost/benefit relative to existing treatments.

Needs Assessment

Most musculoskeletal injuries occur in the home, as a result of an accident or during a sports activity; however, the latter is a significant source of hospitalizations, rehabilitation and lost



productivity. Additionally, sprains, strains and dislocations together account for nearly 50% of all musculoskeletal-related injuries, incurring significant economic costs due to ambulatory visits and hospitalizations. Sprains and strains accounted for nearly 18.4 million musculoskeletal injury treatment episodes in 2006-2007 (the last year for which such estimates were available); most commonly among patients aged 18-44. Dislocations occur most frequently in the 45-64 year age range, and although they're less common, they are more likely to be treated in physician offices.¹

Consider the following statistics from the CDC:

- The 2009 *Health of the U.S.* publication reported that arthritis and other musculoskeletal conditions were the leading causes of activity limitation among working-age adults 18–64 years of age in 2006–2007.²
- The 2009 *National Health Interview Survey* reported 5.9 million injuries occurred playing sports (3.8 million, or 26%, among men and 1.7 million, or 12%, among women – particularly teenagers).³
- The most recent *National Ambulatory Medical Care Survey* reported that family physicians provide patient education on “injury prevention” in over 4.4 million office visits.⁴

Family physicians must be prepared to evaluate a variety of musculoskeletal injuries, including sprains, cartilage and ligament tears, fractures and other traumas. When patients present with acute or chronic musculoskeletal injuries, family physicians can employ a number of examination techniques to assess such factors as range of motion, stability, bone alignment and soft tissue swelling or masses. Although the type of exam depends on the injury and area affected, some of the typical clinical indications in upper and lower extremities include: joint effusion, locking, popping or cracking; pain or stiffness upon movement; crepitation; localized tenderness; and a palpable enlarged mass and/or warmth.^{5,6} The increasing burden of musculoskeletal diseases indicates a need for enhanced training in a number of areas for family physicians, such as proficiency in casting, splinting and joint injections, in order to help patients regain functioning for “everyday activities” or returning to vigorous physical activity.

Additionally, when patients present with acute or chronic musculoskeletal injuries, family physicians can employ a number of examination techniques to assess such factors as range of motion, stability, bone alignment and soft tissue swelling or masses. In the event that injured bones or soft tissue require immobilization to reduce pain, swelling and/or muscle spasms, casting or splinting is often the most appropriate form of treatment.^{7,8} In some cases, patients may benefit from wrapping and taping as a form of stabilization or a prophylactic mechanism for injury prevention.⁹ However, a physician should first thoroughly assess the injured area – including skin, bony structures and neurovascular status – as well as the stage and severity of the injury, potential for instability and functionality, and risk of complications. These steps should be followed to diagnose the injury before determining which mechanism is more suitable, as each has its own advantages and disadvantages.^{7,9}

The AAFP Recommended Curriculum Guidelines for Family Medicine Residents indicates that family medicine residents should possess the following competencies related to musculoskeletal and sports medicine:¹⁰



- Perform an appropriate musculoskeletal history and physical examination, and formulate an appropriate diagnosis and recommend treatment, including requisite subspecialty referrals (Patient Care, Medical Knowledge, Systems-Based Practice)

Data from a recent American Academy of Family Physicians (AAFP) CME Needs Assessment survey indicate that family physicians have statistically significant and meaningful gaps in the medical skill necessary to employ efficacious musculoskeletal exam techniques, including the appropriate use of diagnostic imaging.¹¹ More specifically, CME outcomes data from 2012-2016 AAFP Assembly: *Musculoskeletal Exam Technique* sessions suggest that physicians have knowledge and practice gaps with regard to appropriate application of Ottawa rules; proper examination skills; understanding which diagnostic imaging tests to order, and when to order them; when to order physical therapy; establishing a standardized process for coordinating referrals; being aware of new, more effective tests; and improving surveillance of pathological findings.¹²⁻¹⁶ A review of the literature indicates that inadequacies in musculoskeletal education have previously been documented among medical students, residents, and attending physicians in a number of specialties.¹⁷⁻²⁰

As many family physicians are encouraged to serve as a sports medicine physician in their community (and some may choose to be a team physician), they must be prepared to evaluate acute injuries, including sprains, cartilage and ligament tears, fractures and other traumas.^{21,22} However, family physician residents are frequently inadequately trained to manage musculoskeletal injuries effectively. Over 25% of office visits to U.S. & Canadian physicians are for musculoskeletal pain, and 77% of these musculoskeletal visits are to primary care providers.²³⁻²⁵ However, only 8% of primary care resources and 2% of medical school curricula are dedicated to meeting these musculoskeletal needs. Additionally, most referrals to orthopedic and sports medicine clinics are for common musculoskeletal conditions that could easily be managed by family physicians.^{26,27}

When patients present with acute or chronic musculoskeletal injuries, family physicians can employ a number of examination techniques to assess such factors as range of motion, stability, bone alignment and soft tissue swelling or masses. Although the type of exam depends on the injury and area affected, some of the typical clinical indications in upper and lower extremities include: acute inflammation (indicating tendonitis/bursitis); joint effusion, locking, popping or cracking; pain or stiffness upon movement; crepitation; localized tenderness; and a palpable enlarged mass and/or warmth.^{5,6,28}

In its recommended residency curriculum guidelines, the American Academy of Family Physicians advises that family physicians have the skills and competence to prepare them for treatment and management of patients who require casting or splinting, joint injections or aspirations, dislocation reduction and emergency recognition and stabilization.¹⁰ However, family physicians should also be aware of the differences in treating injuries in pediatric and adult patients. As part of a musculoskeletal exam, family physicians should be prepared to stabilize and mitigate a patient's pain in the event of a traumatic injury and offer appropriate treatment recommendations, such as NSAIDs, pain medication, the "RICE" (rest, ice, compression, elevation) strategy, and new examination techniques.²⁹ Nonsteroidal anti-inflammatory drugs (NSAIDs) can effectively treat painful conditions, but have been associated



with adverse cardiovascular, gastrointestinal, and renal effects; however, topical formulations may provide adequate local pain relief without reaching systemic concentrations high enough to cause adverse events.³⁰ They should also recognize when imaging studies are needed or referral to a sub-specialist is required, in which case they should still coordinate patient care to ensure compliance with treatment and any follow-up protocols. Additionally, physicians should be kept up to date on recent findings in the literature. Recent studies show that the majority of children with inversion ankle injuries and no bony abnormality on plain radiographs appear to have sprains, and nondisplaced Salter-Harris I fractures of the distal fibula are uncommon.³¹

The increasing burden of musculoskeletal diseases indicates a need for enhanced training in a number of areas for family physicians, such as proficiency in casting, splinting and joint injections, in order to help patients regain functioning for “everyday activities” or returning to vigorous physical activity. Although some patients may require referral to sub-specialists for enhanced treatment, having the family physician coordinate care for the patient is the optimal approach to ensure compliance with treatment, oversee medications, help patients and their families cope with a given condition and offer ongoing exams to ensure healthy behavior.

Physicians may improve their ability to apply appropriate musculoskeletal exam techniques by engaging in continuing medical education that provides practical integration of current evidence-based guidelines and recommendations into their standards of care, including, but not limited to the following:^{9,32-40}

- Knee
 - The Ottawa Knee Rule should be used to determine which patients with acute knee injury require radiography.
 - Further testing is not immediately needed in patients with knee injury who have negative physical examination findings, although close clinical follow-up is required.
 - In patients with suspected meniscal injury, the Thessaly test is preferred over the McMurray test and evaluation for joint line tenderness.
 - Internal derangement should be suspected in patients with knee trauma and effusion.
- Hip
 - Initial plain radiography of the hip should include an anteroposterior view of the pelvis and a frog-leg lateral view of the symptomatic hip.
 - Magnetic resonance imaging should be used for detection of occult hip fractures, stress fractures, and osteonecrosis of the femoral head.
 - Magnetic resonance arthrography is the diagnostic test of choice for labral tears.
 - Ultrasonography is a helpful diagnostic modality for patients with suspected bursitis, joint effusion, or functional causes of hip pain (e.g., snapping hip), and can be employed for therapeutic imaging-guided injections and aspirations around the hip.
- Low Back
 - Red flags are common in patients with acute low back pain and do not necessarily indicate serious pathology; therefore, physicians should rely on a comprehensive clinical approach to evaluating red flags in these patients.



- Without findings suggestive of serious pathology, imaging is not indicated in patients with acute low back pain
- Ankle/Foot
 - The Ottawa ankle rules should be used to rule out fractures and prevent unnecessary radiography in patients with suspected ankle sprain.
 - Palpation may reveal tenderness along the tendon, reproducing the patient's pain, and it is important to view the biomechanical alignment of the foot and ankle while the patient is standing and throughout the gait cycle
- Heel
 - Plain radiography is not helpful in diagnosing plantar fasciitis.
 - Bone scans or magnetic resonance imaging is often needed to diagnose a calcaneal stress fracture because plain radiography does not always reveal a fracture.
 - Plain radiographs are usually not helpful in diagnosing Sever disease.
 - Differentiating among causes of heel pain can be accomplished through a patient history and physical examination, with appropriate imaging studies, if indicated.

Physicians may improve their musculoskeletal exam techniques by engaging in continuing medical education that provides practical integration of current evidence-based guidelines and recommendations into their standards of care, including, but not limited to the following:^{9,33-35,41-43}

- Do not order an electromyogram for low back pain unless there is leg pain or sciatica.
- American Academy of Physical Medicine and Rehabilitation
- Do not order an imaging study for back pain without performing a thorough physical examination.
- Low back pain should be classified as nonspecific low back pain, low back pain with potential radicular symptoms, or secondary low back pain associated with a specific spinal cause.
- Do not order imaging studies unless there is concern for infection, fracture, or cauda equina syndrome, or unless required before invasive interventions.
- NSAIDs, opioids, and topiramate (Topamax) are more effective than placebo in the short-term treatment of nonspecific chronic low back pain.
- Acetaminophen, antidepressants (except duloxetine [Cymbalta]), skeletal muscle relaxants, lidocaine patches, and transcutaneous electrical nerve stimulation are not more effective than placebo in the treatment of chronic low back pain.
- Epidural steroid injections are not more effective than placebo for long-term relief of chronic back pain from various causes.
- Spinal manipulation therapy results in small improvements in pain and function in chronic low back pain for up to six months.
- Initial plain radiography of the hip should include an anteroposterior view of the pelvis and a frog-leg lateral view of the symptomatic hip.
- Magnetic resonance imaging should be used for detection of occult hip fractures, stress fractures, and osteonecrosis of the femoral head.
- Magnetic resonance arthrography is the diagnostic test of choice for labral tears.



- Ultrasonography is a helpful diagnostic modality for patients with suspected bursitis, joint effusion, or functional causes of hip pain (e.g., snapping hip), and can be employed for therapeutic imaging-guided injections and aspirations around the hip.
- The presence of a popping sensation in combination with swelling is a significant predictor of an ACL injury.
- Magnetic resonance imaging has a high sensitivity and specificity for confirming an ACL injury.
- If reconstructive surgery is indicated, it should be performed within the five months following injury.
- Early accelerated (19 weeks) and non-accelerated (32 weeks) rehabilitation programs may be beneficial after ACL reconstruction.
- The Ottawa Knee Rule should be used to determine which patients with acute knee injury require radiography.
- Further testing is not immediately needed in patients with knee injury who have negative physical examination findings, although close clinical follow-up is required.
- In patients with suspected meniscal injury, the Thessaly test is preferred over the McMurray test and evaluation for joint line tenderness.
- Internal derangement should be suspected in patients with knee trauma and effusion.
- The Ottawa ankle rules should be used to rule out fractures and prevent unnecessary radiography in patients with suspected ankle sprain.
- Cryotherapy should be applied for the first three to seven days to reduce pain and improve recovery time in patients with ankle sprain.
- An air stirrup brace combined with an elastic compression wrap, or a lace-up support alone, reduces pain and recovery time after an ankle sprain and allows early mobilization.
- Early mobilization and focused range-of-motion exercises reduce pain and recovery time after an ankle sprain, and are preferred to prolonged rest.
- Patients at risk of reinjury after an ankle sprain should participate in a neuromuscular training program.
- Air stirrup braces, lace-up supports, and athletic taping can reduce the risk of ankle sprains during sports.
- Anatomic snuffbox swelling, scaphoid tubercle tenderness, and pain with axial pressure on the first metacarpal bone are sensitive but not specific tests for diagnosing scaphoid fractures.
- If plain radiography results are negative in a suspected scaphoid fracture, then the wrist should be protected in a thumb spica cast with repeat plain radiography in 10 to 14 days or a bone scan one to two days after injury.
- Corticosteroid injections in the shoulder have only short-term benefits in adhesive capsulitis and subacromial impingement syndrome.
- Corticosteroid injections for lateral and medial epicondylitis lead to short-term improvement but have a high rate of recurrence and are no better than other options in the long term.
- Corticosteroid injections provide short-term relief from symptoms of knee and hip osteoarthritis in patients who wish to delay surgery.



Physicians can improve patient satisfaction with the referral process by using readily available strategies and tools such as, improving internal office communication, engaging patients in scheduling, facilitating the appointment, tracking referral results, analyzing data for improvement opportunities, and gathering patient feedback.^{44,45}

These recommendations are provided only as assistance for physicians making clinical decisions regarding the care of their patients. As such, they cannot substitute for the individual judgment brought to each clinical situation by the patient's family physician. As with all clinical reference resources, they reflect the best understanding of the science of medicine at the time of publication, but they should be used with the clear understanding that continued research may result in new knowledge and recommendations. These recommendations are only one element in the complex process of improving the health of America. To be effective, the recommendations must be implemented. As such, physicians require continuing medical education to assist them with making decisions about specific clinical considerations.

Resources: Evidence-Based Practice Recommendations/Guidelines/Performance Measures

- Stress fractures: diagnosis, treatment, and prevention⁴⁶
- Diagnosis and management of metatarsal fractures⁴⁷
- Update on acute ankle sprains⁹
- Diagnosis of heel pain³⁹
- Diagnosis and treatment of plantar fasciitis⁴⁸
- Tendinopathies of the foot and ankle⁴⁰
- Diagnosis and treatment of acute low back pain³²
- Acute lumbar disk pain: navigating evaluation and treatment choices⁴⁹
- Evaluation of hip pain in older adults⁵⁰
- Hip impingement: identifying and treating a common cause of hip pain⁵¹
- Anterior cruciate ligament injury: diagnosis, management, and prevention⁵²
- Evaluating the patient with a knee injury⁵³
- Evaluating Acutely Injured Patients for Internal Derangement of the Knee³³
- Diagnosis and treatment of biceps tendinitis and tendinosis⁵⁴
- Evaluation and diagnosis of wrist pain: a case-based approach³⁴
- Slipped capital femoral epiphysis: diagnosis and management⁵⁵
- Manual medicine guidelines for musculoskeletal injuries⁵⁶
- Management of ACL Injuries: Clinical Practice Guideline from the AAOS⁴²
- Management of Acute Achilles Tendon Rupture⁵⁷
- Treatments for Sciatica⁵⁸
- AIUM practice guideline for the performance of a musculoskeletal ultrasound examination⁵⁹
- Exam documentation: charting within the guidelines⁶⁰
- FamilyDoctor.org. Ankle Sprains: Healing and Preventing Injury (patient education)⁶¹
- FamilyDoctor.org. Dealing With Sports Injuries (patient education)⁶²

References



1. Gunnar A. The Burden of Musculoskeletal Diseases in the U.S.: Prevalence, Societal and Economic Cost. Rosemont, IL: American Academy of Orthopaedic Surgeons; 2008: <http://www.boneandjointburden.org/>. Accessed July 2012.
2. U.S. Department of Health & Human Services. Health - United States - 2009 With Special Feature on Medical Technology. In: Prevention CfDCa, ed2009:574.
3. Adams PF, Heyman KM, Vickerie JL. Summary health statistics for the U.S. population: National Health Interview Survey, 2008. *Vital and health statistics Series 10, Data from the National Health Survey*. 2009(243):1-104.
4. Centers for Disease Control and Prevention (CDC). National Ambulatory Medical Care Survey (NAMCS). 2009;
5. Bussieres AE, Taylor JA, Peterson C. Diagnostic imaging practice guidelines for musculoskeletal complaints in adults--an evidence-based approach. Part 1. Lower extremity disorders. *Journal of manipulative and physiological therapeutics*. 2007;30(9):684-717.
6. Bussieres AE, Peterson C, Taylor JA. Diagnostic imaging guideline for musculoskeletal complaints in adults-an evidence-based approach-part 2: upper extremity disorders. *Journal of manipulative and physiological therapeutics*. 2008;31(1):2-32.
7. Boyd AS, Benjamin HJ, Asplund C. Splints and casts: indications and methods. *American family physician*. 2009;80(5):491-499.
8. Boyd AS, Benjamin HJ, Asplund C. Principles of casting and splinting. *American family physician*. 2009;79(1):16-22.
9. Tiemstra JD. Update on acute ankle sprains. *American family physician*. 2012;85(12):1170-1176.
10. American Academy of Family Physicians (AAFP). Musculoskeletal and Sports Medicine. *Recommended Curriculum Guidelines for Family Medicine Residents* AAFP Reprinting No.265:
11. AAFP. 2012 CME Needs Assessment: Clinical Topics. American Academy of Family Physicians; 2012.
12. American Academy of Family Physicians (AAFP). AAFP FMX CME Outcomes Report. Leawood KS: AAFP; 2016.
13. American Academy of Family Physicians (AAFP). AAFP FMX CME Outcomes Report. Leawood KS: AAFP; 2015.
14. American Academy of Family Physicians (AAFP). 2012 AAFP Scientific Assembly: CME Outcomes Report. Leawood KS: AAFP; 2012.
15. American Academy of Family Physicians (AAFP). 2013 AAFP Scientific Assembly: CME Outcomes Report. Leawood KS: AAFP; 2013.
16. American Academy of Family Physicians (AAFP). AAFP Assembly CME Outcomes Report. Leawood KS: AAFP; 2014.
17. Comer GC, Liang E, Bishop JA. Lack of proficiency in musculoskeletal medicine among emergency medicine physicians. *Journal of orthopaedic trauma*. 2014;28(4):e85-87.
18. Bishop JY, Awan HM, Rowley DM, Nagel RW. Development and validation of a musculoskeletal physical examination decision-making test for medical students. *Journal of surgical education*. 2013;70(4):451-460.
19. Kelly M, Bennett D, Bruce-Brand R, O'Flynn S, Fleming P. One week with the experts: a short course improves musculoskeletal undergraduate medical education. *J Bone Joint Surg Am*. 2014;96(5):e39. doi: 10.2106/JBJS.M.00325.



20. Truntzer J, Lynch A, Kruse D, Prislun M. Musculoskeletal education: an assessment of the clinical confidence of medical students. *Perspectives on medical education*. 2014;3(3):238-244.
21. Almquist J, Valovich McLeod TC, Cavanna A, et al. Summary statement: appropriate medical care for the secondary school-aged athlete. *Journal of athletic training*. 2008;43(4):416-427.
22. Herring SA, Kibler WB, Putukian M. Team Physician Consensus Statement: 2013 update. *Medicine and science in sports and exercise*. 2013;45(8):1618-1622.
23. Caudill TJ, Gee C, Holbrook B, et al. The use of pain scales: the incorporation and utilization of faces scales in pediatric patients: a research proposal. *Kentucky nurse*. 2005;53(3):21-22.
24. Power JD, Perruccio AV, Desmeules M, Lagacé C, Badley EM. Ambulatory physician care for musculoskeletal disorders in Canada. *The Journal of rheumatology*. 2006;33(1):133-139.
25. Perruccio AV, Power JD, Badley EM. Revisiting arthritis prevalence projections--it's more than just the aging of the population. *The Journal of rheumatology*. 2006;33(9):1856-1862.
26. Menzies RD, Young RA. Referrals from a primary care-based sports medicine department to an orthopaedic department: a retrospective cohort study. *British journal of sports medicine*. 2011;45(13):1064-1067.
27. Butcher JD, Zukowski CW, Brannen SJ, et al. Patient profile, referral sources, and consultant utilization in a primary care sports medicine clinic. *The Journal of family practice*. 1996;43(6):556-560.
28. Bussieres AE, Taylor JA, Peterson C. Diagnostic imaging practice guidelines for musculoskeletal complaints in adults--an evidence-based approach--part 3: spinal disorders. *Journal of manipulative and physiological therapeutics*. 2008;31(1):33-88.
29. National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS). Sports Injuries. Handout on Health. *NIH Publication No 09-5278* 2009;
30. Jordan J. Topical NSAIDs for Acute Musculoskeletal Pain in Adults. *American family physician*. 2016;94(1).
31. Boutis K, Plint A, Stimec J, et al. Radiograph-Negative Lateral Ankle Injuries in Children: Occult Growth Plate Fracture or Sprain? *JAMA pediatrics*. 2016;170(1):e154114.
32. Casazza BA. Diagnosis and treatment of acute low back pain. *American family physician*. 2012;85(4):343-350.
33. Grover M. Evaluating acutely injured patients for internal derangement of the knee. *American family physician*. 2012;85(3):247-252.
34. Shehab R, Mirabelli MH. Evaluation and diagnosis of wrist pain: a case-based approach. *American family physician*. 2013;87(8):568-573.
35. Wilson JJ, Furukawa M. Evaluation of the patient with hip pain. *American family physician*. 2014;89(1):27-34.
36. Borchers JR, Best TM. Common finger fractures and dislocations. *American family physician*. 2012;85(8):805-810.
37. Edmonds EW, Dengerink DD. Common conditions in the overhead athlete. *American family physician*. 2014;89(7):537-541.



38. Kane SF, Lynch JH, Taylor JC. Evaluation of elbow pain in adults. *American family physician*. 2014;89(8):649-657.
39. Tu P, Bytowski JR. Diagnosis of heel pain. *American family physician*. 2011;84(8):909-916.
40. Simpson MR, Howard TM. Tendinopathies of the foot and ankle. *American family physician*. 2009;80(10):1107-1114.
41. Herndon CM, Zoberi KS, Gardner BJ. Common questions about chronic low back pain. *American family physician*. 2015;91(10):708-714.
42. Management of ACL Injuries: Clinical Practice Guideline from the AAOS. *American family physician*. 2015;92(3):232-234.
43. Foster ZJ, Voss TT, Hatch J, Frimodig A. Corticosteroid Injections for Common Musculoskeletal Conditions. *American family physician*. 2015;92(8):694-699.
44. Jarve RK, Dool DW. Simple tools to increase patient satisfaction with the referral process. *Family practice management*. 2011;18(6):9-14.
45. American Academy of Family Physicians (AAFP). FPM Toolbox: Referral Management. 2013;
46. Patel DS, Roth M, Kapil N. Stress fractures: diagnosis, treatment, and prevention. *American family physician*. 2011;83(1):39-46.
47. Hatch RL, Alsobrook JA, Clugston JR. Diagnosis and management of metatarsal fractures. *American family physician*. 2007;76(6):817-826.
48. Goff JD, Crawford R. Diagnosis and treatment of plantar fasciitis. *American family physician*. 2011;84(6):676-682.
49. Gregory DS, Seto CK, Wortley GC, Shugart CM. Acute lumbar disk pain: navigating evaluation and treatment choices. *American family physician*. 2008;78(7):835-842.
50. Verrill MM, Hall MN, Loven B. FPIN's clinical inquiries. Evaluation of hip pain in older adults. *American family physician*. 2012;86(4):1-2.
51. Kuhlman GS, Domb BG. Hip impingement: identifying and treating a common cause of hip pain. *American family physician*. 2009;80(12):1429-1434.
52. Cimino F, Volk BS, Setter D. Anterior cruciate ligament injury: diagnosis, management, and prevention. *American family physician*. 2010;82(8):917-922.
53. Ebell MH. Evaluating the patient with a knee injury. *American family physician*. 2005;71(6):1169-1172.
54. Churgay CA. Diagnosis and treatment of biceps tendinitis and tendinosis. *American family physician*. 2009;80(5):470-476.
55. Peck D. Slipped capital femoral epiphysis: diagnosis and management. *American family physician*. 2010;82(3):258-262.
56. National Guideline Clearinghouse. Manual medicine guidelines for musculoskeletal injuries. 2013;
57. Miller L, Spittler J, Khodae M, Bravman JT, Lyon C, Hoffecker L. Management of acute achilles tendon rupture. *American family physician*. 2015;91(11):794-800.
58. Stephenson A, Kelsberg G, Neher JO, St Anna L. Treatments for sciatica. *American family physician*. 2015;91(9):612-615.
59. American College of R, Society for Pediatric R, Society of Radiologists in U. AIUM practice guideline for the performance of a musculoskeletal ultrasound examination. *Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine*. 2012;31(9):1473-1488.



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60. Moore KJ. Exam documentation: charting within the guidelines. *Family practice management*. 2010;17(3):24-29.
61. FamilyDoctor.org. Ankle Sprains: Healing and Preventing Injury. 1996;
62. FamilyDoctor.org. Dealing With Sports Injuries. 2000;