

ED Legal Letter™

The Essential Monthly Guide to Emergency Medicine Malpractice Prevention and Risk Management

From the publishers of *Emergency Medicine Reports* and *ED Management*

2004 Best Instructional Reporting - Third Place
Newsletter & Electronic Publishers Association

Thomson American Health Consultants Home Page—<http://www.ahcpub.com> For more information, call (800) 688-2421.

CME for Physicians—<http://www.cmeweb.com>

THOMSON
AMERICAN HEALTH
CONSULTANTS

EXECUTIVE EDITOR

James Hubler, MD, JD, FCLM, FAAEM, FACEP
Clinical Assistant Professor of Surgery, Department of Emergency Medicine, University of Illinois College of Medicine at Peoria; OSF Saint Francis Medical Center, Peoria

EDITORIAL BOARD

Kay Ball, RN, MSA, CNOR, FAAN
Perioperative Consultant/Educator, K&D Medical, Lewis Center, OH

Robert Bitterman, MD, JD, FACEP
Director of Risk Management and Managed Care Department of Emergency Medicine Carolinas Medical Center, Charlotte, NC

Paul Blaylock, MD, JD, FACEP
Emergency Medicine Physician, Southwest Washington Medical Center, Emanuel Medical Center; Member, Board of Governors, American College of Legal Medicine; Retired of Counsel, Miller, Nash, Wiener, Hager & Carlsen, Attorneys at Law, Portland, OR

Eric T. Boie, MD, FAAEM
Staff Physician and Clinical Practice Chair, Department of Emergency Medicine, Mayo Clinic; Assistant Professor of Emergency Medicine, Mayo Medical School, Rochester, MN

Theresa Rodier Finerty, RN, MS
Director, Emergency and Trauma Services, OSF Saint Francis Medical Center Peoria, IL

Jonathan D. Lawrence, MD, JD, FACEP
Emergency Physician, St. Mary Medical Center, Medical-Legal Consultant, Long Beach, CA

J. Tucker Montgomery, MD, JD, FCLM
Montgomery & Pierce, Knoxville, TN

Gregory P. Moore MD, JD
Kaiser Permanente, Sacramento, CA; Volunteer Clinical Faculty, University of California-Davis Emergency Medicine Residency

Daniel J. Sullivan, MD, JD, FACEP
Chairman, Department of Emergency Medicine, Ingalls Memorial Hospital; Associate Professor of Emergency Medicine, Rush Medical College, Harvey, IL

William Sullivan, DO, JD, FCLM
Clinical Instructor, Department of Emergency Medicine, Midwestern University, Downers Grove, IL; Clinical Assistant Professor, Department of Emergency Medicine, University of Illinois, Chicago

Jay C. Weaver, JD, EMT-P
Boston Public Health Commission
Emergency Medical Services; Adjunct Faculty, Northeastern University, Boston

A bad break: Preventing potential orthopedic litigation

BY **JAMES R. HUBLER, MD, JD, FCLM, FAAEM, FACEP**, CLINICAL ASSISTANT PROFESSOR OF SURGERY, DEPARTMENT OF EMERGENCY MEDICINE, UNIVERSITY OF ILLINOIS COLLEGE OF MEDICINE AT PEORIA; OSF SAINT FRANCIS MEDICAL CENTER, PEORIA, IL; **SCOTT M. SCHEPKER, MD**, EMERGENCY MEDICINE RESIDENT, DEPARTMENT OF EMERGENCY MEDICINE, UNIVERSITY OF ILLINOIS COLLEGE OF MEDICINE AT PEORIA.

Editor's note: *The Centers for Disease Control and Prevention (CDC) note that fractures were the fourth-leading cause of injury-related emergency department (ED) visits in 2000, accounting for 3.8 million visits.¹ Patients may develop serious and life-threatening complications of orthopedic trauma. Because signs and symptoms of these complications may not be readily apparent when patients present, emergency physicians (EPs) and nurses need to be cognizant of high-risk presentations. In a 1997 review of 105 negligence claims against EPs in the United Kingdom, 54 claims involved missed diagnoses of a fracture because of failure to obtain radiographs or interpret the films correctly; 27 claims were due to incomplete clinical examination; and 24 claims alleged clinical mismanagement.² Even when reasonable clinical judgment is exercised in the treatment of fractures, litigation can follow.³ This month's issue focuses on these high-risk presentations, including open fractures, compartment syndromes, malignancies, and septic joints.*

Open Fractures

Case #1. *Collins v. Dennis, MD, and United Medical Center.*⁴ A 13-year-old presented to the ED complaining of right arm pain after falling in wet, muddy grass. The ED physician, Dr. Windsor Dennis, obtained a plain radiograph of the injured extremity, which revealed a fracture of the patient's forearm. An orthopedist was consulted, who later classified the fracture as "open" because of the presence of a small, pinpoint-sized puncture of the skin near the fracture site. Dr. Dennis cleansed the skin and wound with Betadine,

performed a closed reduction of the fracture, prescribed an oral, broad-spectrum antibiotic, and instructed the patient's mother to schedule a return visit to his office within 48 hours. The mother failed to bring the child to the orthopedist's office for the scheduled visit. Five days following the initial ED visit, the patient experienced severe pain in her arm and leakage from the cast. The patient was subsequently evaluated at a second ED where she was diagnosed with a serious infection of the forearm.

The mother's malpractice claim was first presented to a medical review panel, which concluded that the orthopedist did not violate the applicable standard of care in his treatment. Nevertheless, the matter was tried before a jury in August 2000, when it again was determined the orthopedist's treatment had met the standard of care. At appeal, the plaintiff's attorney argued that because the fracture was classified as open due to the pinpoint-sized puncture, it required surgical cleaning, which the

defendant admittedly did not provide. Dr. Dennis, on the other hand, stated that the wound seemed clean without visible contamination.

Dr. Dennis, in fact, denied seeing a laceration or exposed bone. He further testified that if the site of the injury had appeared contaminated with mud or grass particles, he would have cleaned the patient's arm, but he did not do so. Moreover, a well-documented medical record from the initial ED visit confirmed Dr. Dennis' account of the injury and his opinion that the bone actually had not protruded through the skin. Therefore, the defendant opted to treat the patient conservatively with closed reduction and antibiotics.

The key to the defendants' case was the fact that throughout the trial, no physician accurately testified that surgical debridement is necessary in every instance of an open fracture. Rather, all agreed that in a very small percentage of cases — those in which the treating physician is presented with a small, clean wound and makes the clinical judgment that the bone has not protruded through the skin — the conservative treatment approach used by the defendant is clinically appropriate. Indeed, the jury heard two directly conflicting opinions of the standard of care and found in favor of the defendants.

Discussion. Even though the defendants were victorious in defending their actions, the case demonstrates several important aspects of emergency medical care. First, the case confirms the importance of meticulous documentation, not only regarding the gross appearance of the limb, but also accompanying information regarding neurovascular competency and a detailed description of the wound. Next, a brief discussion outlining alternative treatments, as well as risks and benefits of the proposed treatment and details regarding follow-up, must be explained thoroughly to the patient upon discharge. Key components of any discharge document should include: 1) instructions detailing the treatment; 2) information regarding when, where, and how to arrange appropriate follow-up care; and, most importantly, 3) conditions upon which the patient should return to the ED for evaluation. Following these risk management suggestions can help prevent a lengthy, expensive, and widely publicized legal encounter. Not only did the patient fail to follow-up as directed, she went to a second ED to receive subsequent care — an ED unfamiliar with her past medical history, prior ED treatment, and consultations from her initial visit.

ED Legal Letter™, ISSN 1087-7341, is published monthly by Thomson American Health Consultants, 3525 Piedmont Road N.E., Bldg. 6, Suite 400, Atlanta, GA 30305.

Vice President/Publisher: Brenda Mooney
Editorial Group Head: Valerie Loner
Managing Editor: Martha Jo Dendinger
Senior Production Editor: Nancy McCreary
GST Registration Number: R128870672.
Periodicals postage paid at Atlanta GA 30304.
POSTMASTER: Send address changes to **ED Legal Letter**, P.O. Box 740059, Atlanta, GA 30374.

Copyright 2004 by Thomson American Health Consultants. All rights reserved. No part of this newsletter may be reproduced in any form or incorporated into any information-retrieval system without the written permission of the copyright owner.

Back issues: \$82. Missing issues will be fulfilled by customer service free of charge when contacted within one month of the missing issue's date.

Opinions expressed are not necessarily those of this publication, the executive editor, or the editorial board. Mention of products or services does not constitute endorsement. Clinical, legal, tax, and other comments are offered for general guidance only; professional counsel should be sought in specific situations.

This CME activity is intended for emergency physicians. It is in effect for 36 months from the date of the publication.

THOMSON
★
AMERICAN HEALTH CONSULTANTS

Now available on-line at www.ahcpub.com/online.html

Statement of Financial Disclosure

To reveal any potential bias in this publication, and in accordance with Accreditation Council for Continuing Medical Education guidelines, Dr. Hubler (executive editor & co-author); Advisory Board members Ball, Bitterman, Blaylock, Boie, Finerty, Lawrence, Montgomery, Moore, D. Sullivan, W. Sullivan, Weaver and Dr. Schepker (co-author) have reported no relationships with companies having ties to the field of study covered by this CE/CME program. This publication does not receive commercial support.

Subscriber Information

Customer Service: (800) 688-2421

Customer Service E-Mail Address:
customerservice@ahcpub.com

Editorial E-Mail Address: martha.dendinger@thomson.com
World Wide Web: <http://www.ahcpub.com>

Subscription Prices

United States: \$489 per year

Multiple Copies:

Discounts are available for multiple subscriptions. For pricing information, call Steve Vance at (404) 262-5511.

Canada: \$519 per year plus GST

Elsewhere: \$519 per year

Accreditation

Thomson American Health Consultants is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide CME for physicians. American Health Consultants (AHC) designates this educational activity for up to 18 credit hours in Category 1 credit toward the AMA Physician's Recognition Award. **ED Legal Letter™** is also approved by the American College of Emergency Physicians for 18 hours of ACEP Category 1 credit. This CME activity was planned and produced in accordance with the ACCME Essentials.

This continuing education program is sponsored by Thomson American Health Consultants, which is accredited as a provider of continuing education in nursing by the American Nurses Credentialing Center's Commission on Accreditation. Provider approved by the California Board of Registered Nursing for approximately 18 contact hours. Provider #CEP10864.

Questions & Comments

Please contact **Martha Jo Dendinger**, Managing Editor, at martha.dendinger@thomson.com or (404) 262-5514.

Undoubtedly, the jury considered the mother's failure to follow-up in its decision to reach a verdict for the defense.

If active bleeding is present in an open fracture, a compression dressing should be placed on it. If bleeding persists, a tourniquet or insufflated sphygmomanometer cuff may be applied as a last resort and only in short intervals.⁵ Vessels should not be clamped, as clamping can damage them or result in the inadvertent clamping of an adjacent nerve. Any obvious joint dislocations or prominent bone fragments causing undue pressure on the soft tissues or neurovascular structures should be reduced with careful attention to vascular stability of the limb.^{6,7}

If pulses are absent because the displacement resulted in kinking and decreased pulse pressures in an otherwise normal vessel, a reduction may restore blood flow. The benefits of restoration of arterial blood flow after reduction far outweigh the advantages of the contaminated bones being left displaced or of joints being left dislocated from fear that foreign material will be introduced into the depths of the wound; the joint or fracture subsequently will be re-dislocated in the operating room during debridement.

After reduction maneuvers have been performed, the pulses are rechecked. If palpable pulses were lost or still are not present after these maneuvers, a Doppler examination is required in addition to an emergency surgical consultation.⁸ If pulses are heard or felt, the vascular status of the limb is observed carefully over time — suggested periods of follow-up range from days to months. If, on the other hand, pulses still are absent after Doppler examination, the vascular status must be evaluated immediately with angiography or direct surgical exploration.^{9,10}

Percutaneous arteriography performed in a radiology suite is the most commonly used invasive diagnostic technique in patients with a suspected vascular injury. The accuracy of this technique has been demonstrated in many studies; however, delays are common when on-call technicians must return to the hospital or proper diagnostic equipment is unavailable.¹¹

Following initial assessment in the ED, the wound is dressed sterilely and a splint is applied to the limb. The extent of the wound is well documented in the medical record. The remainder of the orthopedic examination is completed, with the examiner noting any areas of pain, obvious deformities, lacerations or bruises. Approximately 25% of skeletal injuries are missed in the trauma patient with multiple injuries.

These injuries are often in the hand and foot, and these areas should be evaluated carefully.¹²

Open fractures require the expertise of an orthopedic surgeon. Careful surgical debridement of dead material and all devitalized tissue, preservation of adequate blood supply to the area, and fixation of the bone, are the cornerstones of managing these fractures.

Most contaminated wounds requiring delayed primary closure, including fractures, should be irrigated with Ringer's solution, saline, and/or topical antibiotics during the procedure. There have been conflicting studies on the importance of prompt surgical debridement.¹³ Overall, the conservative risk management approach would be to obtain orthopedic consultation and suggest operative debridement.¹⁴⁻¹⁵

Regardless of whether surgical debridement is performed, patients should be given appropriate antibiotics. The most important factor in reducing the infection rate is the early administration of antibiotics that provide antibacterial activity against both gram-positive and gram-negative microorganisms.¹⁶

Administration of appropriate antibiotics, however, should *not* be used as a substitute for adequate debridement of necrotic and contaminated tissues; they must be used in conjunction with debridement when surgery is indicated. As the previous case suggests, appropriate consultation does not absolve the EP from some responsibility and the potential for litigation.

Extent of Injuries

Case #2. *Maddox v. Schriever, et al.*¹⁷ Mrs. Janice Maddox presented to the ED after a piece of metal deeply sliced her arm near her elbow while at work. The EP, Dr. Paul Schriever, repaired the laceration and instructed the patient to follow up with her company doctor in 10 days for wound evaluation and suture removal. The patient returned to work the day following her injury, where she was placed on restricted duty. She followed up with her company doctor as instructed, who examined the wound and removed the patient's sutures but failed to diagnose a ruptured biceps tendon or consult an appropriate specialist.

Mrs. Maddox continued to experience pain and malfunction of her arm and eventually sought the opinion of an orthopedic surgeon independently, who subsequently diagnosed her with a ruptured biceps tendon. Unfortunately, the therapeutic window for

operative repair of the tendon injury had long since expired. Additional testing performed by an independent evaluator showed that the patient was left with a 15% permanent disability of her arm.

The patient sued the EP and his employer, as well as the company doctor and his employer, for medical malpractice. Just days prior to trial, Mrs. Maddox dismissed the claims against the company doctor and his employer with prejudice. At trial, the plaintiff described the day-to-day impact the disability had on her life, although she admitted that she returned to work the day after the incident and worked until she voluntarily left to bear and raise her child. The jury later returned a verdict of \$533,000 in favor of the plaintiff, which the court entered as its judgment. The judge consequently denied the defendants' motion for a new trial. The case was appealed and a new trial ordered on determination and review of damages only.

Discussion. The take-home point in this case is agonizingly obvious: A physician must complete a thorough and complete physical examination to evaluate the extent of a patient's injury. Even the most minor-appearing laceration can involve underlying muscles, tendons, vascular structures, or nervous tissue. An intricate assessment of function and neurovascular stability is essential.

The vast majority of all injuries to biceps are proximal, and nearly all involve the proximal long head. Injuries are usually the result of repetitive microtrauma and overuse. Rupture of the biceps tendon usually occurs in middle-aged to older individuals with a history of chronic bicipital tenosynovitis and when there is sudden or prolonged contraction against resistance. Additional risk factors for rupture include previous rotator cuff or contralateral biceps tendon rupture, age older than 50, poor general shoulder conditioning, and rheumatoid arthritis. A snap or pop usually is described, and pain is present in the anterior shoulder. Examination of the anterior shoulder will reveal swelling, tenderness, and often crepitus over the bicipital groove. Flexion of the forearm, best accomplished with the arm abducted and externally rotated, will elicit pain and may produce a visible bulge several inches above the antecubital fossa (the Popeye sign) with concomitant ecchymosis along the inner aspect of the arm representing the distally retracted biceps muscle. Comparing arms for symmetry may help reveal obvious deformity in the injured extremity. Loss of strength

is minimal due to the function of the brachialis and supinators. Radiographs of the shoulder should be obtained as avulsion fractures occasionally occur.

General ED treatment includes sling placement, ice application, analgesics, and referral to an orthopedic surgeon for definitive care. Surgical repair usually is recommended for young, active patients. A conservative approach with immobilization may be adequate for elderly patients whose activities of daily living are not compromised significantly by the injury.

Distal biceps injuries are quite rare.¹⁸⁻¹⁹ Complete ruptures of the tendon are most common in middle-aged men and usually involve the dominant extremity. Mechanism of injury is similar to that of proximal injuries. With rupture of the distal biceps, pain is felt in the antecubital fossa, with swelling, ecchymosis, and tenderness to palpation noted on examination. Inability to palpate the distal biceps tendon in the antecubital fossa and a mid-arm "ball" indicate a distal rupture. Strength loss, especially supination, is usually greater than with proximal ruptures. Radiographs should be obtained to search for an associated avulsion fracture. While most complete distal ruptures are diagnosed clinically, magnetic resonance imaging (MRI) and ultrasound (US) can aid in confirming the diagnosis of partial tears.²⁰

ED treatment includes sling placement, ice application, analgesics, and referral to an orthopedic surgeon for definitive care. Without surgical repair of complete ruptures, supination strength is decreased by approximately 50% and flexion strength by almost 30%. Therefore, in young active individuals, most authorities recommend surgical repair.²¹

Shoulder Pain

Case #3. *McKain v. Moore, MD, Kalamazoo Emergency Associates, PC, et al.*²² On March 29, 1985, Clarence McKain, accompanied by his fiancée, presented to the ED complaining of right shoulder pain. The EP initially evaluated the patient, and a radiograph was obtained. The patient was diagnosed with a muscle strain, placed in a sling, and encouraged to remain home from work for several days. Sometime between the time he arrived at the ED and his discharge, he signed an arbitration agreement.

The following day, the radiologist reviewed the shoulder radiographs, diagnosed a defect or possible

malignancy in the lateral portion of the patient's right scapula, and recommended follow-up testing. Regrettably, no further action was taken, and the patient was not notified of the diagnosis or given recommendation for follow-up. More than two months later, Mr. McKain returned to the facility with continued shoulder pain, and further diagnostic testing lead to the definitive diagnosis of osteosarcoma, a malignant bone tumor.

Almost 12 months following the initial evaluation, Mr. McKain and his then wife filed suit in circuit court alleging medical malpractice against the named defendants. Mr. McKain died less than a month after filing suit as a result of the osteosarcoma. The defendants moved to compel arbitration. Plaintiff's attorney responded with a motion for summary disposition, claiming that the signed arbitration agreement was invalid. Upon appeal, the judge ruled that the arbitration agreement signed at the time of the initial evaluation was valid and binding. Accordingly, he granted the defendants' motion to compel arbitration and denied the plaintiffs' motion for summary disposition.

Discussion. This case has several risk management lessons. First, an arbitration agreement between parties may reduce court costs, avoid inflated judgment by sympathetic juries, and reduce time to settlement bringing closure for all parties. If permitted by state law, EPs and nurses may suggest that their institutions adopt a policy regarding arbitration. (*Editor's note: Seek out local legal advice as to whether this is a viable alternative for your practice.*)

In these types of missed malignancy cases, the difficulty is in proving causation. It is very unlikely that the failure to notify the patient of the x-ray results would have had any difference in outcome for this patient. In negligence causes of action, all four elements must be satisfied: duty, breach, causation, and damages. The difficulty is in proving the breach actually caused harm to the patient. As in this case, the rapid deterioration and death of this patient probably could not have been prevented. However, litigation could have been prevented if policies for notifying patients of x-ray results had been followed. (**See ED Legal Letter, October 2002, pp. 109-120, for a discussion on this issue.**)

Shoulder pain is a common problem that can pose difficult diagnostic and therapeutic challenges for the EP. (**See ED Legal Letter, July**

1999, pp. 53-62.) It is the third most common musculoskeletal complaint in the general population and accounts for 5% of all general practitioner musculoskeletal consults.²³ The incidence of shoulder pain is 6.6 to 25 cases per 1,000 patients, with a peak incidence in the fourth through sixth decades.²⁴ Shoulder pain is second only to knee pain for referrals to orthopedic surgery or primary care sports medicine clinics.²⁵ Furthermore, 8% to 13% of athletic injuries involve the shoulder and account for up to 3.9% of ED visits.²⁶

The challenge for the physician evaluating shoulder pain is the myriad etiologies and the potential for multiple disorders. Regarding the aforementioned case, consider the following statistic: Tendinitis is the most common diagnosis at the shoulder, representing nearly 70% of all diagnoses involving shoulder pain.²⁷

Furthermore, primary bone tumors are uncommon malignancies, but they are an important cause of cancer morbidity and mortality. In the United States, approximately 2,400 primary bone tumors (excluding malignancies arising in the bone marrow) will be diagnosed in 2003, and 1,300 deaths will result.²⁸ For many of these tumors, most notably osteosarcoma and Ewing's sarcoma, remarkable progress in surgical techniques and multidisciplinary management during the last 40 years has resulted in significant improvements in the likelihood of cure and limb salvage. Therefore, early detection and diagnosis is essential in the formulation of a treatment plan for the patient.

This case reminds the EP that malignancies should to be considered in any patient with musculoskeletal complaints. The EP must review the entire x-ray for suggestion of tumor. The clinical presentation of bone tumors typically is characterized by pain and swelling at the affected site. Patients often present when soft tissue extension already has occurred. Symptoms may have been present for weeks or months. Movement can be restricted or local changes of inflammation or venous stasis may be present, often making the diagnosis difficult. A patient rarely may present with a pathologic fracture through the tumor, which is a poor prognostic indicator. Radiographs are essential in the initial evaluation of a suspected bone lesion because the results may suggest the diagnosis and ensure appropriate further investigation. Computerized tomography (CT) can be helpful locally when the radiographic appearances are confusing, particularly in

areas of complex anatomy. Cross-sectional images provide a clearer indication of bone destruction and the extent of any soft-tissue mass than do radiographs. CT particularly can be helpful in flat bones in which periosteal changes can be more difficult to appreciate. MRI is the modality of choice in evaluating the local extent of disease because of its excellent bone marrow and soft tissue contrast and multiplanar capabilities. Treatment is directed around surgery, with limb salvage when possible. Presurgical chemotherapy generally is used.

Common complaints of patients with shoulder pain include weakness, stiffness, instability, locking, catching, and deformity.²⁹ Determining the duration of symptoms and mechanism of injury will narrow the differential diagnosis. If trauma occurred, the mechanism can determine radiological needs. Aggravating and alleviating factors should be reviewed, including work, recreation, sports, or hobbies. Night pain when lying on the affected side and a history of trauma in a patient older than 65 years both suggest a rotator cuff tear, but no individual symptom is definitive for the diagnosis.³⁰ Pain with overhead work may indicate impingement syndrome, especially if the patient is symptomatic with movement through the arc of 60°-120°.

The physical examination should include observation, palpation, range of motion (ROM), and provocative testing. Muscle atrophy of either the supraspinatus or infraspinatus muscles is moderately predictive of rotator cuff tears in the elderly population, with a positive predictive value of 81%.¹² Palpation in discerning acromioclavicular joint from shoulder and neck pathology makes it a useful part of the examination. The shoulder's ROM should be evaluated both actively and passively. After assessing the ROM, the next steps are to evaluate the rotator cuff and biceps tendon, perform impingement testing, and check for instability.

Often, no imaging is required, or plain radiographs are the sole imaging study needed. Soft-tissue injuries are best identified by MRI or US, whereas bony pathology is seen best with plain radiographs or CT. Indications for imaging include severe injury, uncontrolled pain, failure of conservative therapy, return-to-play considerations, and examiner discretion. Although disorders of the rotator cuff and other intrinsic structures of the shoulder are the most common cause of shoulder pain, extrinsic conditions outside the shoulder

Table 1. Differential Diagnosis of Shoulder Pain

- Malignancy
- Disorders of the rotator cuff
- Degenerative disease of the cervical spine
- Brachial plexus injury
- Thoracic outlet syndrome
- Suprascapular nerve injury
- Myocardial ischemia or infarction
- Pulmonary embolism
- Splenic infarction or injury
- Ruptured ectopic pregnancy
- Muscular strain
- Injuries to other tendons (e.g., biceps, deltoid)
- Degenerative disc disease
- Brachial plexus neuritis
- Pancoast tumor
- Acute thrombosis of the axillary artery
- Pneumonia
- Pulmonary empyema
- Perforated viscus
- Biliary tract disease

complex can refer pain to the shoulder, thus making the differential diagnosis rather extensive. **Table 1** summarizes a general differential diagnosis of shoulder pain.

Generally, follow-up for shoulder pain with the primary provider within one week will suffice. Orthopedic consultation may be reserved for severe cases or those patients who fail to respond to a conservative treatment.

Compartment Syndrome

Case #4. *Merritt v. Saratoga Hospital, et al.*³¹ On the afternoon of April 23, 1997, Melissa Merritt fell and injured her forearm. Later that evening, Ms. Merritt reported to the ED at Saratoga Hospital. An examination by Dr. Albert Jagoda revealed the patient's forearm was swollen in the proximity of her left wrist. Based upon his initial assessment, Dr. Jagoda ordered a radiograph of Ms. Merritt's left arm. The staff radiologist issued a preliminary report indicating the absence of an occult fracture, prompting Dr. Jagoda to conclude the patient had sustained merely a sprain. Accordingly, he ordered a splint to be applied to the patient's wrist and the patient to be discharged with instructions to follow up with her primary care physician.

The next day, Ms. Merritt's father arrived at her

apartment to find her lethargic and difficult to arouse. Upon arrival at Albany Medical Center, Ms. Merritt was suffering from septic shock. She was assessed by Dr. James Edmond, chief of plastic surgery at the hospital, who performed a surgical decompression of the patient's left arm and thereafter several additional reparative procedures.

Following her recovery, on Oct. 31, 2003, Ms. Merritt filed a medical malpractice suit against the Saratoga Hospital, Dr. Jagoda, and Saratoga Emergency Physicians, PC, for failing to diagnose and address her condition when she was evaluated in 1997.

The plaintiff argued that upon initial presentation to the Saratoga Hospital Emergency Department, she was suffering from "compartment syndrome" in her left arm, which Dr. Jagoda failed to diagnose and treat, resulting in the injuries diagnosed upon her admission to Albany Medical Center. The action against the hospital was dismissed. Thereafter, Dr. Jagoda and Saratoga Emergency Physicians moved for summary judgment dismissing the complaint against them. The Supreme Court of New York denied the motion, prompting an appeal.

In support of the motion for summary judgment, the defendants submitted Dr. Edmond's affidavit, in which the surgeon verified that when he first examined the plaintiff, her left arm was cadaverous and the patient moribund. Although there was no history of intravenous (IV) or intramuscular medications having been administered during the patient's initial evaluation at the Saratoga ED, Dr. Edmond reported the presence of a small puncture wound and needle tracks within the antecubital fossa of Ms. Merritt's left arm. Furthermore, the surgeon recalled a "pyramid" of deteriorated muscles originating at the site of the puncture wound.

In summary, Dr. Edmond believed Ms. Merritt had sustained a penetrating rather than blunt injury to her left arm. The plastic surgeon testified that compartment syndrome normally develops following blunt trauma to an extremity or other closed compartment. Based upon those findings, he explained that the plaintiff's condition was caused by the puncture wound and the concomitant injection of some sort of caustic substance into the arm and not by a developing compartment syndrome as the result of her fall on April 23, 1997. Moreover, Dr. Edmond further affirmed that Ms. Merritt most likely suffered from the puncture wound shortly

before presenting to the Albany Medical Center and definitely *after* being evaluated by Dr. Jagoda.

The plaintiff's expert argued that Ms. Merritt suffered from significant soft-tissue swelling and pain in her left forearm when she presented to Saratoga Hospital. According to this expert witness, significant swelling usually is the first sign of possible compartment syndrome. He further corroborated the amount of pain described in the nurses' notes dated April 23, 1997, was in fact much greater than one would expect to experience from a bruise or strain, and that severe pain is yet another sign of compartment syndrome. Thus, the plaintiff's expert alleged that Dr. Jagoda deviated from good and accepted medical practice in failing to properly recognize and treat the plaintiff's compartment syndrome, which was the proximate cause of her injuries rather than some superseding event.

The court order was reversed, and the summary judgment awarded to the defendants, thus dismissing the complaint against them. The judge cited Dr. Edmond's testimony, which makes clear that regardless of any alleged failure to recognize and address symptoms of compartment syndrome, the offending injury at bar was the result of a puncture wound sustained subsequent to the plaintiff's visit to the Saratoga ED.

Discussion. Fortunately, the history and detailed physical exam were well documented, as the facts in this case carried a tremendous amount of evidentiary weight. EPs must be certain to read the nurses' notes and document any significant discrepancies found in the medical record. It is unlikely the plaintiff in this case had compartment syndrome on presentation. EPs must maintain a broad differential diagnosis when evaluating patients, consider compartment syndrome, and provide all patients with directions for when to return to the ED, such as increased pain, numbness, tingling, significant swelling, or discoloration suggesting decreased blood flow.

Acute compartment syndrome (ACS) is a condition in which raised pressures within a closed fascial space reduce capillary perfusion resulting in compromise of circulation to tissues within that space. ACS is seen more commonly in patients younger than 35 years and often is associated with loss of function and long-term disability.³² The result of unidentified and unchecked ACS can be catastrophic and include neurologic deficit, muscle necrosis, ischemic contracture, infection, and delayed healing

of an underlying fracture. The most common fractures associated with ACS include those involving the tibia shaft, distal radius, and ulna. Approximately 23% of compartment syndromes are caused by soft-tissue injuries — particularly crush-type injuries without apparent fracture, and an additional 18% occur in relation to fractures of the forearm.³³ Other common causes include ischemic reperfusion injuries, burns, or prolonged limb compression (i.e., poor limb positioning during surgery).^{34,35} Clinicians should be aware that the compartment pressure can be raised inadvertently by various methods of immobilizing fractures including, but not limited to, the application of long-leg casts following reduction of a lower extremity fracture, which lengthens and narrows the surrounding compartment volume.³⁶

Additionally, ACS has been described in IV drug abusers who inject toxic substances, such as heroin, morphine, lysergic acid diethylamide, and methadone into the artery of an extremity.^{37,38} Cases of atraumatic ACS often result in severe sequelae that otherwise would be preventable with surgical intervention. Most tragically, the diagnosis may be missed because often patients still are intoxicated at the time of presentation, and complaints likely are attributed to the patient's impaired mental status.

ACS is a surgical emergency, which if not detected and treated early can lead to devastating disabilities, amputation, or even death. Thus, early recognition is key. Initially, a high index of suspicion is required to make the diagnosis. The hallmark symptoms of ACS include pain out of proportion to the apparent injury and paresthesia. The consistent clinical signs are tense, swollen, and tender compartments, pain on passive stretching of the muscle, and sensory loss.

Several methods have been described as useful in the diagnosis of ACS including near infrared spectroscopy, MRI, scintigraphy, and laser Doppler flowmetry. However, the most traditional and reliable method remains monitoring of intracompartmental pressure (ICP).³⁹ Although measuring the ICP of a swollen and tender extremity may aid in the diagnosis, it is not absolutely necessary. If compartment syndrome is clinically evident, one should proceed directly to fasciotomy.⁴⁰ In some community settings where reliable methods of ICP monitoring may not be available readily, clinical assessments must be repeated — preferably by the same clinician — at frequent intervals to clinically detect a progressive

compartment syndrome. Patients with high-risk injuries for developing ACS based upon mechanism of injury or associated comorbidity, such as a bleeding diatheses, require close follow-up. Compartment pressures of less than 15 mmHg are safe. Pressures of 20 to 30 mmHg may cause damage if they persist for several hours. Levels in this range may be closely followed clinically with repeat pressure measurements. Pressures of 30 to 40 mmHg generally are considered grounds for emergent fasciotomy. Early surgical or orthopedic consultation is generally the rule.

Hip Pain

Case #5. *Matheny v. Fairmont General Hospital et al.*⁴¹ On Jan. 12, 1996, Ronald Matheny sought treatment at the Fairmont General Hospital ED for pain in his right hip, which began after he attempted to push a car from a snow bank. During his initial evaluation, the patient developed a fever. His temperature rose a full three degrees prior to discharge. Regardless, the treating EP, Dr. Robert Thompson, diagnosed Mr. Matheny with a “hip injury/severe arthritis,” and he was released from the ED with crutches, pain medications, and instructions to apply ice to his hip. No attempt was made to ascertain the source of Mr. Matheny's fever or to treat it.

During the next several days, Mr. Matheny's condition worsened, and on Jan. 17, he was admitted to the hospital with an infection of his right hip. He had developed an abscess within the right hip, which was later postulated to be caused by an untreated staphylococcal infection. As a result, Mr. Matheny suffered numerous complications requiring a lengthy hospital stay and several invasive procedures to drain the abscess, leaving him with limited function in his right hip. Following several additional weeks of rehabilitation, the patient required a cane to ambulate.

On June 9, 1997, Mr. Matheny and his wife filed a suit maintaining Dr. Thompson and Fairmont General Hospital were negligent in the care and treatment they provided to Mr. Matheny on the grounds that failure to diagnose an infection of the patient's hip resulted in his subsequent suffering and disability. A jury trial was held and ultimately Dr. Thompson settled his portion of the plaintiff's claim for an undisclosed amount. Consequently, the issue of alleged negligence on the part of Fairmont General

remained. The plaintiff's attorney argued that, although the nursing staff had recorded Mr. Matheny's three-degree rise in temperature during his visit to the ED, they failed to alert Dr. Thompson of the same, thereby contributing to Dr. Thompson's failure to diagnose the plaintiff's infection and ensuing disability. During the circuit court's charge to the jury, the court correctly instructed the jury that Fairmont General *could* be found at fault if it determined the hospital had overtly caused the infection *or* inadvertently allowed Mr. Matheny's infection to progress to an abscess. The defendant, Fairmont General Hospital, argued that Mr. Matheny was responsible for progression of the infection, which allegedly resulted from his delay in seeking further medical treatment. Following nearly two hours of deliberation, the jury sent a note to the trial judge asking, "If we decide it was the doctor's fault, is the hospital ultimately responsible?" After hearing arguments from both parties on how to address the question, the judge responded that since Dr. Thompson had agreed to settle, the decision regarding liability should be focused upon the actions of the nursing staff. A short time later, the jury returned a verdict in favor of Fairmont General. The plaintiffs then filed a motion for a new trial, which was denied.

Discussion. Again, this case illustrates the importance of reading nurses' notes and addressing abnormal vitals, either through documentation or further investigation. Patients with severe pain may require additional testing or close follow-up to facilitate accurate diagnosis, particularly when the initial diagnosis may be unclear. Hip pain is a common symptom with myriad possible causes. In a survey of 6,596 adults ages 60 years and older, 14.3% reported significant hip pain on most days during the previous six weeks.⁴² Trochanteric and gluteus medius bursitis, osteoarthritis, and fractures of the femur are the most common conditions affecting the hip.⁴³

The character and location of the pain, the movement and positions that reproduce the pain, and the affect on ambulation can be used to distinguish conditions affecting soft tissues from disorders affecting the hip joint and adjacent bones. Increased pain with or after use (particularly with weight-bearing activities) and improvement with rest is the hallmark of a structural joint problem, particularly osteoarthritis. By comparison, constant pain, especially pain at night, suggests an infectious, inflammatory, or neoplastic process.

Lateral hip pain is unlikely to be due to hip joint disease. Lateral hip pain that is aggravated by direct pressure is the classic pattern of trochanteric bursitis. Lumbar radiculopathy, particularly involving L₄₋₅, causes lateral hip pain that extends over a much wider area, radiating down the leg and into the foot, with or without associated foot numbness.⁴⁴

Anterior hip or groin pain suggests primary involvement of the hip joint itself. A gradual onset of pain in association with variable degrees of impaired movement is consistent with osteoarthritis.⁴⁵

Posterior (gluteal) hip pain is the least common pain pattern affecting the hip and is most often a sign of sacroiliac joint disease, lumbar radiculopathy, herpes zoster, or an unusual presentation of the hip joint. Patients with posterior hip pain often undergo extensive examination and radiographic testing of the back and hip to define a precise cause. Patients with aortoiliac occlusive disease (Leriche's syndrome) may present with pain in the buttock, hip, and, in some cases, thigh claudication. Patients presenting with lower anterior thigh pain pose the greatest clinical challenge. Primary disease of the hip joint, primary and secondary lesions of the upper femur, stress fracture of the femoral neck, and upper lumbar radiculopathy can refer pain to the lower thigh (or even the anterior knee).

Unless the pain can be reproduced by passive rotation of the hip joint, by applying torque to the thigh (femur), or by maneuvers designed to elicit radicular symptoms (e.g., straight leg raising), most patients with lower anterior thigh pain require specific radiographic procedures to define a precise cause.⁴⁶ **Table 2** summarizes the differential diagnosis of hip pain.

A plain radiograph should be performed in patients with acute hip pain to exclude fracture. Further imaging studies, especially MRI, may be necessary when the history, physical examination, and plain radiographs are inconclusive. MRI is the radiographic study of choice for suspected fracture not demonstrated by plain x-ray, early diagnosis, and accurate staging of osteonecrosis, as well as evaluation for infection and tumor. Radionuclide bone scan is reserved for suspected fracture or osteonecrosis not demonstrated by plain film radiography when MRI is not available. Diagnostic ultrasonography primarily is used to evaluate children for hip effusions and to guide aspiration attempts in adults.⁴⁷

The preceding case illustrates the necessity of early recognition of septic arthritis. Immediate

Table 2. Differential Diagnosis of Hip Pain

- Trochanteric bursitis
- Lumbar radiculopathy
- Inguinal hernia
- Sacroiliac joint disease
- Rheumatoid arthritis
- Avascular necrosis (LCPD)
- Lumbar disc herniation
- Transient acute synovitis
- Post-streptococcal reactive arthritis
- Septic arthritis
- Primary or metastatic cancer
- Osteoarthritis
- Lower abdominal pathology
- Herpes zoster
- Fracture of the femoral neck
- Aortoiliac occlusive disease
- Meralgia paresthetica
- Juvenile rheumatoid arthritis
- Acute rheumatic fever
- Slipped capital femoral epiphysis

Key: LCPD=Legg-Calvé-Perthes disease.

arthrocentesis is recommended when hip pain is acute and severe or if there is other suggestive evidence of infection, such as a fever. Patients with bacterial arthritis present acutely with a single swollen and painful joint (i.e., monoarticular arthritis).⁴⁸ The knee is involved in more than 50% of cases but wrists, ankles, and hips are commonly infected.⁴⁹ Approximately 20% of infections are polyarticular, usually involving two or three joints.

Most cases of bacterial arthritis arise from hematogenous spread to the joint.⁵⁰⁻⁵² Common predisposing factors include injection drug use, indwelling catheters, and an underlying immunocompromised state, such as human immunodeficiency virus (HIV) infection. Neonates and the elderly are at highest risk. In some cases, bacterial arthritis is the presenting sign of infective endocarditis.⁵¹

Staphylococcus aureus is the most common bacterium infecting adult joints.⁵² Gram-negative bacilli often are present more in IV drug users, neonates, the elderly, and patients with major immune deficiency. The definitive diagnostic test is identification of bacteria in the synovial fluid. Synovial fluid culture is positive in the majority of patients with nongonococcal bacterial arthritis.⁵² Gram stain test is positive in most but not all cases. The infected fluid is usually purulent with an average leukocyte count

of 50,000-150,000 cells/mm³. Blood cultures are positive in 50% of cases and should be obtained in any patient with suspected bacterial arthritis. Other laboratory findings, such as an increased white blood cell count and an elevated erythrocyte sedimentation rate, are common but nonspecific.

Conclusion

In a survey of medical malpractice attorneys performed in 2000, those interviewed alleged that 6% to 25% of all medical malpractice litigation involves orthopedic conditions.⁵³ The detection of complications requires that the physician attend to every complaint of the patient, examine the patient clinically at frequent intervals, assess any positive clinical findings, and when necessary, proceed with special investigations. The EP must arrange for follow-up and provide detailed discharge instructions indicating when to return to the ED.

Endnotes

1. Ly N, McCaig LF. National hospital ambulatory medical care survey: 2000 emergency department summary. *Advance Data* 2002;326:1-31.
2. Gwynne A, Barber P, Tavener F. A review of 105 negligence claims against accident and emergency departments. *J Accid Emerg Med* 1997;14:243-245.
3. Fears RL, Gleis GE, Seligson D. Diagnosis and Treatment of Complications. In: Browner BD, Jupiter JB, Levine AM, et al., eds. *Skeletal Trauma*. 2nd ed. Philadelphia: WB Saunders; 1998, pp. 543-588.
4. *Collins v. Windsor Dennis, MD and United Medical Center*. No. 2001-CA-0086, Court of Appeals of Louisiana, Fourth Circuit (Aug. 7-9, 2000). Rehearing Dec. 5, 2001.
5. Navein J, Coupland R, Dunn R. The tourniquet controversy. *J Trauma-Injury Infect Crit Care* 2003;54:S219-220.
6. Tscherne H. Management of wounds in fractures with soft-tissue injuries [German]. *Zeitschrift fur Kinderchirurgie* 1983;38:34-39.
7. Solan MC, Calder JD, Gibbons CE, et al. Photographic wound documentation after open fracture. *Injury* 2001; 32:33-35.
8. Johansen K, Lynch K, Paun M, et al. Non-invasive vascular tests reliably exclude occult arterial trauma in injured extremities. *J Trauma* 1991;31:515-522.
9. Feliciano DV. Evaluation and Treatment of Vascular Injuries. In: Browner BD, Jupiter JB, Levine AM, et al, eds. *Skeletal Trauma*. 2nd ed. Philadelphia: W B Saunders; 1992, pp. 349-364.
10. Sibbitt RR, Palmaz JC, Garcia F, et al. Trauma of the

- extremities: Prospective comparison of digital and conventional angiography. *Radiology* 1986;160:179-182.
11. Richardson JD, Vitale GC, Flint LM Jr. Penetrating arterial trauma: Analysis of missed vascular injuries. *Arch Surg* 1987;122:678-683.
 12. Ward WG, Nunley JA. Occult orthopaedic trauma in the multiply injured patient. *J Orthop Trauma* 1991;5: 308-312.
 13. Skaggs DL, Kautz SM, Kay RM, et al. Effect of delay of surgical treatment on rate of infection in open fractures in children. *J Ped Ortho* 2000;20:19-22.
 14. Sanders R, Swionkowski M, Nunley J, et al. The management of fractures with soft-tissue disruptions. *J Bone Joint Surg [Am]* 1993;75:778-789.
 15. Behrens FF. Fractures with Soft Tissue Injuries. In: Browner BD, Jupiter JB, Levine AM, et al. In: Browner BD, Jupiter JB, Levine AM, et al. eds. *Skeletal Trauma*. 2nd ed. Philadelphia: WB Saunders; 1998, pp. 391-418.
 16. Patzakis MJ, Wilkins J. Factors influencing infection rate in open fracture wounds. *Clin Ortho* 1989;243:36-40.
 17. *Maddox v. Schriever, et al.*, No. A02A2052, Court of Appeals of Georgia (Feb. 11, 2003).
 18. Baker BE, Bierwagen D. Rupture of the distal tendon of the biceps brachii. Operative versus non-operative treatment. *J Bone Joint Surg [Am]* 1985;67:414.
 19. Bernstein AD, Breslow MJ, Jazrawi LM. Distal biceps tendon ruptures: A historical perspective and current concepts. *Am J Orthop* 2001;30:193.
 20. Miller TT, Adler RS. Sonography of tears of the distal biceps tendon. *Am J Roentgenol* 2000;175:1081.
 21. Proust AF, Bredenkamp JH, Uehara DT. Injuries to the elbow and forearm. In: Tintinalli JE, Kelen GD, Stapczynski JS. *Emergency Medicine: A Comprehensive Study Guide*. 6th ed. New York City: McGraw-Hill; 2004, pp. 1684-1694.
 22. *McKain v. Moore, M., Kalamazoo Emergency Associates, PC, et al.*, No. 96098, Court of Appeals of Michigan, (Oct. 17, 1988).
 23. Urwin M, Symmons D, Allison T, et al. Estimating the burden of musculoskeletal disorders in the community: The comparative prevalence of symptoms at different anatomical sites, and the relation to social deprivation. *Ann Rheum Dis* 1998;57:649-655.
 24. Bjelle A. Epidemiology of shoulder problems. *Baillieres Clin Rheumatol* 1989;3:437-451.
 25. Butcher JD. Patient profile, referral sources, and consultant utilization in a primary care sports medicine clinic. *J Fam Pract* 1996;43:556-560.
 26. Watters DA, Brooks S, Elton RA, et al. Sports injuries in an accident and emergency department. *Arch Emerg Med* 1984; 1:105-111.
 27. Fraenkel, L, Shearer, P, Mitchell, P, et al. Improving the selective use of plain radiographs in the initial evaluation of shoulder pain. *J Rheumatol* 2000; 27:200.
 28. Jemal A, Murray T, Samuels A, et al. Cancer statistics, 2003. *CA Cancer J Clin* 2003;53:5.
 29. Howard T, O'Connor FG. The injured shoulder: Primary care assessment *Arch Fam Med* 1997;6:376-384.
 30. Litaker D, Pioro M, El Bilbeisi H, et al. Returning to the bedside: Using the history and physical exam to identify rotator cuff tears. *J Am Geriatr Soc* 2000;48:1633-1637.
 31. *Merritt v. Saratoga Hospital et al.*, Supreme Court, Appellate Division, Third Department, New York (Oct. 31, 2002).
 32. McQueen MM, Christie J, Court-Brown CM. Acute compartment syndrome in tibial diaphyseal fractures. *J Bone Joint Surg [Br]* 1996;78:95-98.
 33. McQueen MM, Gaston P, Court-Brown CM. Acute compartment syndrome: Who is at risk? *J Bone Joint Surg [Br]* 2000;82:200-203.
 34. Mulhall JP, Dresner AD. Postoperative compartment syndrome and the lithotomy position: A report of three cases and analysis of potential risk factors. *Conn Med* 1993; 57:129-133.
 35. Goldsmith AL, McCallum MI. Compartment syndrome as a complication of the prolonged use the Lloyd-Davies position. *Anaesthesia* 1996;51:1048-1052.
 36. Matsen FA III, Clawson DK. The deep posterior compartment syndrome of the leg. *J Bone Joint Surg [Am]* 1975;57:34-39.
 37. Kaufer H, Spengler DM, Noyes FR, et al. Orthopedic implications of the drug subculture. *J Trauma* 1974;14:853-867.
 38. Rutgers PH, van der Harst E, Koumans RK. Surgical implications of drug-induced rhabdomyolysis. *Br J Surg* 1991; 78:490-492.
 39. Elliot KGB, Johnstone AJ. Diagnosing acute compartment syndrome. *J Bone Joint Surg [Br]* 2003;85:625-632.
 40. Lagerstrom CF, Reed RL II, Rowlands BJ, et al. Early fasciotomy for acute clinically evident post-traumatic compartment syndrome. *Am J Surg* 1989;158:36-39.
 41. *Matheny v. Fairmont General Hospital, Inc., et al.*, No. 30256, Supreme Court of Appeals of West Virginia (Dec. 6, 2002).
 42. Christman C, Crespo CJ, Frankowiak SC, et al. How common is hip pain among older adults? Results from the Third National Health and Nutrition Examination Survey. *J Fam Pract* 2002;51:345.
 43. Anderson BC. *Office Orthopedics for Primary Care: Diagnosis and Treatment*. 2nd ed. Philadelphia: WB Saunders; 1999, pp. 125-137.
 44. Kortelainen P, Puranen J, Koivisto E, et al. Symptoms and signs of sciatica and their relation to the localization of the lumbar disc herniation. *Spine* 1985;10:88-92.
 45. Moskowitz RW. Clinical and laboratory findings in osteoarthritis. In: Koopman WJ, ed. *Arthritis and Allied Conditions*. Baltimore: Williams and Wilkins; 1997, pp.1985.
 46. Steinberg GG, Seybold EA. Hip and pelvis. In: Steinberg GG, Akins CM, Baran DT, eds. *Orthopedics in Primary Care*. 3rd ed. Baltimore: Lippincott Williams & Wilkins; 199, pp. 171-203.
 47. Cardinal E, Chhem RK, Beauregard CG. Ultrasound-guided

interventional procedures in the musculoskeletal system. *Radiol Clin North Am* 1998;36:597.

48. Mikhail IS, Alarcon GS. Nongonococcal bacterial arthritis. *Rheum Dis Clin North Am* 1993;19:311.
49. Goldenberg DL. Septic arthritis and other infections of rheumatologic significance. *Rheum Dis Clin North Am* 1991; 17:149.
50. Morgan DS, Fisher D, Marianos A, et al. An 18-year clinical review of septic arthritis from tropical Australia. *Epidemiol Infect* 1996;117:423.
51. Sapico FL, Liqueste JA, Sarma RJ. Bone and joint infections in patients with infective endocarditis: Review of a 4-year experience. *Clin Infect Dis* 1996;22:783.
52. Goldenberg DL, Red JI. Bacterial arthritis. *N Engl J Med* 1985; 312:764.

CE/CME Instructions

Physicians and nurses participate in this continuing medical education/continuing education program by reading the article, using the provided references for further research, and studying the questions at the end of the article. Participants should select what they believe to be the correct answers, then refer to the list of correct answers to test their knowledge. To clarify confusion surrounding any questions answered incorrectly, please consult the source material.

At the conclusion of this semester, you must complete the evaluation form that will be provided at that time, and return it in the reply envelope that will be provided to receive a certificate of completion. When your evaluation is received, a certificate will be mailed to you.

CE/CME Objectives

[For information on subscribing to the CE/CME program, contact customer service at (800) 688-2421 or e-mail customerservice@ahcpub.com.]

The participants will be able to:

- identify high-risk patients and use tips from the program to minimize the risk of patient injury and medical malpractice exposure;
- identify a "standard of care" for treating particular conditions covered in the newsletter;
- identify cases in which informed consent is required;
- identify cases which include reporting requirements;
- discuss ways in which to minimize risk in the ED setting.

In Future Issues:

Expert Witnesses

53. Klimo GF, Daum WJ, Brinker MR, et al. Orthopedic medical malpractice: An attorney's perspective. *Am J Orthop* 2000;29:93-97.

CE/CME Questions

5. When measured directly, which of the following compartmental pressures is considered safe?
 - A. Less than 15 mmHg
 - B. 20-25 mmHg
 - C. 25-30 mmHg
 - D. 30-35 mmHg
 - E. 35-40 mmHg
6. What is the most common bacterial isolate found in adults with septic arthritis?
 - A. *Escherichia coli*
 - B. *Pseudomonas aeruginosa*
 - C. *Staphylococcus epidermidis*
 - D. *Streptococcus pyogenes*
 - E. *Staphylococcus aureus*
7. All of the following are signs and symptoms of a proximal bicep tendon rupture *except*:
 - A. Swelling and tenderness to palpation in the antecubital fossa
 - B. Ecchymosis along the inner aspect of the arm
 - C. Complete inability to supinate forearm
 - D. Inability to palpate the distal biceps tendon in the antecubital fossa
 - E. Visible bulge several inches above the antecubital fossa
8. All of the following statements concerning open fractures are true *except*:
 - A. The principal goals in treating open fractures are to restore function and bony union promptly and to avoid complications such as infections.
 - B. Adequate debridement of necrotic and contaminated tissues is not necessary if appropriate antibiotic therapy can be initiated in a timely fashion.
 - C. If pulses are absent because the displacement resulted in kinking and decreased pulse pressures in an otherwise normal vessel, a reduction may restore blood flow.
 - D. After a couple of days when swelling has regressed, a second inspection of the wound and further debridement, under strict asepsis, may be necessary.

Answers: 5. A; 6. E; 7. C; 8. B.