

# Emergency Medicine Reports

**2002 Index and Trauma Reports  
supplement enclosed with this issue**

Volume 24, Number 2

January 13, 2003

*Deep vein thrombosis (DVT) is a common and potentially life-threatening peripheral vascular disease that emergency physicians (EPs) frequently consider, diagnose, and treat in their practice. The typical patient at risk for DVT presents with unilateral lower extremity swelling, pain, or discoloration. The definitive diagnosis often is impossible to ascertain based upon clinical findings alone, as numerous non-thrombotic conditions share similar signs and symptoms. Unless an alternative diagnosis confidently can be established with a high degree of certainty, EPs typically rely upon ultrasound (US) imaging to rule out DVT.*

*Frustrated with the time delays and availability of ultrasound imaging after-hours, more and more EPs are acquiring the skills to perform and interpret lower extremity US. Although evaluation for DVT is not considered a primary application in emergency medicine US, many EPs already have recognized the benefit of adding this particular application to their arsenal.*

*The purpose of this article is to review the anatomy and pathophysiology of DVT as it relates to ultrasonographic imaging, both to provide a deeper understanding of the disease and to serve as an introduction to the performance of DVT ultrasound by the EP.*

—The Editor

## Emergency Ultrasound Part II: Diagnosis of Deep Venous Thrombosis

**Authors:** **Christopher L. Moore, MD, RDMS**, Assistant Professor, Section of Emergency Medicine, Yale University School of Medicine, New Haven, CT; **Michael J. Lambert, MD, RDMS**, Clinical Assistant Professor, Department of Emergency Medicine, University of Illinois College of Medicine; Fellowship Director, Emergency Ultrasound, Resurrection Medical Center, Chicago, IL.

**Peer Reviewers:** **Anthony Macasaet, MD**, Assistant Professor and Vice Chair, Director Emergency Medicine Ultrasound, Department of Emergency Medicine, Chicago Medical School, Chicago, IL; **Kenneth H. Butler, DO**, Associate Residency Director, University of Maryland Emergency Medicine Residency Program, University of Maryland School of Medicine, Baltimore.

### Incidence

The exact incidence of DVT is unknown. Existing data suggest that about 80 cases per 100,000 persons occur annually. Approximately 1 person in 20 develops DVT during her or his lifetime, and 600,000 hospitalizations for DVT occur annually in the United States.<sup>1</sup> Although frequently subclinical, DVT invariably precedes the development of pulmonary embolism, estimated to occur in more than 500,000 patients per year in the United States, 11% of whom die within the first hour.

### Diagnosis

The diagnosis of DVT has evolved significantly since its first documentation. While venography still is widely considered the

**EDITOR IN CHIEF**

**Gideon Bosker, MD, FACEP**  
Special Clinical Projects and Medical Education Resources  
Assistant Clinical Professor  
Section of Emergency Services  
Yale University School of Medicine  
Associate Clinical Professor  
Oregon Health Sciences University

**EDITORIAL BOARD**

**Paul S. Auerbach, MD, MS, FACEP**  
Clinical Professor of Surgery  
Division of Emergency Medicine  
Department of Surgery  
Stanford University School of Medicine  
Stanford, California

**Brooks F. Bock, MD, FACEP**  
Dayanandan Professor and Chairman  
Department of Emergency Medicine  
Detroit Receiving Hospital  
Wayne State University  
Detroit, Michigan

**William J. Brady, MD, FACEP, FAAEM**  
Vice Chairman of Emergency Medicine and Associate Professor,  
Department of Emergency Medicine,  
Associate Professor of Internal Medicine and Program Director of Emergency Medicine Residency,  
Department of Internal Medicine  
University of Virginia School of Medicine  
Charlottesville, Virginia

**Kenneth H. Butler, DO**  
Associate Residency Director  
University of Maryland Emergency Medicine Residency Program  
University of Maryland School of Medicine  
Baltimore, Maryland

**Michael L. Coates, MD, MS**  
Professor and Chair  
Department of Family and Community Medicine  
Wake Forest University School of Medicine  
Winston-Salem, North Carolina

**Alasdair K.T. Conn, MD**  
Chief of Emergency Services  
Massachusetts General Hospital  
Boston, Massachusetts

**Charles L. Emerman, MD**  
Chairman  
Department of Emergency Medicine  
MetroHealth Medical Center  
Cleveland Clinic Foundation  
Cleveland, Ohio

**Frederic H. Kauffman, MD, FACEP**  
Associate Professor of Medicine  
Temple University School of Medicine  
Philadelphia, Pennsylvania

**Kurt Kleinschmidt, MD, FACEP**  
Assistant Professor  
University of Texas Southwestern Medical Center, Dallas  
Associate Director  
Department of Emergency Medicine  
Parkland Memorial Hospital  
Dallas, Texas

**David A. Kramer, MD, FACEP**  
Program Director,  
Associate Professor  
Emergency Medicine Residency  
York Hospital/Penn State University  
York, Pennsylvania

**Larry B. Mellick, MD, MS, FAAP, FACEP**  
Chair and Professor  
Department of Emergency Medicine  
Section Chief, Pediatric Emergency Medicine  
Medical College of Georgia  
Augusta, Georgia

**Paul E. Pepe, MD, MPH, FACEP, FCCM**  
Professor and Chairman  
Division of Emergency Medicine  
University of Texas Southwestern Medical Center  
Dallas, Texas

**Charles V. Pollack, MA, MD, FACEP**  
Chairman, Department of Emergency Medicine, Pennsylvania Hospital  
Associate Professor of Emergency Medicine  
University of Pennsylvania School of Medicine  
Philadelphia, Pennsylvania

**Robert Powers, MD, MPH, FACP, FACEP**  
Chief and Professor, Emergency Medicine  
University of Connecticut  
School of Medicine  
Farmington, Connecticut

**David J. Robinson, MD, MS**  
Research Director and Assistant Professor  
Department of Emergency Medicine  
The University of Texas Houston Medical Center  
Director, Diagnostic Observation Center  
Memorial Hermann Hospital  
Houston, Texas

**Steven G. Rothrock, MD, FACEP, FAAP**  
Associate Professor of Emergency Medicine  
University of Florida College of Medicine,  
Department of Emergency Medicine  
Orlando Regional Medical Center  
Orlando, Florida

**Barry H. Rumack, MD**  
Director, Emeritus  
Rocky Mountain Poison and Drug Center  
Clinical Professor of Pediatrics  
University of Colorado Health Sciences Center  
Denver, Colorado

**Richard Salluzzo, MD, FACEP**  
Chief Executive Officer and Chief Medical Officer  
Conemaugh Health System  
Johnstown, Pennsylvania

**Sandra M. Schneider, MD**  
Professor and Chair  
Department of Emergency Medicine  
University of Rochester School of Medicine  
Rochester, New York

**John A. Schriver, MD**  
Chief, Section of Emergency Medicine  
Yale University School of Medicine  
New Haven, Connecticut

**David Sklar, MD, FACEP**  
Professor and Chair  
Department of Emergency Medicine  
University of New Mexico School of Medicine  
Albuquerque, New Mexico

**Corey M. Slovis, MD, FACP, FACEP**  
Professor and Chairman  
Department of Emergency Medicine  
Vanderbilt University School of Medicine,  
Medical Director  
Metro Nashville EMS  
Nashville, Tennessee

**J. Stephan Stapezynski, MD**  
Professor and Chairman  
Department of Emergency Medicine  
University of Kentucky Medical Center  
Lexington, Kentucky

**Charles E. Stewart, MD, FACEP**  
Emergency Physician  
Colorado Springs, Colorado

**David A. Talan, MD, FACEP**  
Chairman and Professor of Medicine  
UCLA School of Medicine  
Department of Emergency Medicine  
Olive View/UCLA Medical Center  
Los Angeles, California

**Gregory A. Vulturo, MD, FACEP**  
Vice Chairman and Associate Professor  
Department of Emergency Medicine  
University of Massachusetts Medical School  
Worcester, Massachusetts

**Albert C. Weith, MD**  
Program Director  
Emergency Medicine Residency  
Assistant Professor of Medicine and Surgery  
Department of Surgery  
Section of Emergency Medicine  
Yale University School of Medicine  
New Haven, Connecticut

**Steven M. Winograd, MD, FACEP**  
Attending Physician  
Department of Emergency Medicine  
Jeannette District Memorial Hospital  
Jeannette, Pennsylvania;  
St. Clair Memorial Hospital  
Pittsburgh, Pennsylvania

**Allan B. Wolfson, MD, FACEP, FACP**  
Program Director,  
Affiliated Residency in Emergency Medicine  
Professor of Emergency Medicine  
University of Pittsburgh  
Pittsburgh, Pennsylvania

gold standard, this invasive and time-consuming test is not technically adequate in a significant percentage of patients<sup>1</sup> and now is widely reserved for patients in whom doubt exists following other diagnostic studies. For the symptomatic emergency department (ED) patient, US is the initial study of choice.<sup>2</sup>

Pooled results have shown US performed by radiologists to be 95% sensitive and 98% specific in the diagnosis of lower extremity DVT in symptomatic patients.<sup>2,3</sup> The sensitivity is poorer (around 59%) when US is used for screening patients who are at high risk (post-op, etc.) but asymptomatic.<sup>4</sup>

## Anatomy

To understand the use of US in the diagnosis of DVT, it is essential to understand the anatomy and terminology of the deep

venous system. While there also are deep veins in the upper extremities, this review will cover the lower extremity anatomy. (See Figure 1.)

From proximal to distal, as the iliac vein crosses below the inguinal ligament it becomes the common femoral vein. This vein is medial to the artery in the proximal thigh. The greater saphenous vein, which is a superficial vein on the medial side of the leg, usually joins the common femoral vein in the upper thigh. As the common femoral vein continues distally, it goes deeper and moves somewhat laterally relative to the artery to a position almost directly below the artery, where it bifurcates into the deep (profunda) femoral vein and the superficial femoral vein. Only the very proximal portions of the deep (profunda) femoral vein may be available to US interrogation, if at all.

The superficial femoral vein continues through the medial thigh to the adductor canal. It is important to note that the superficial femoral vein, while more superficial than the deep femoral vein, is a misnomer in that it is both part of the deep venous system and relatively deep compared to such veins as the saphenous. As the superficial femoral vein passes through the adductor canal, it becomes the popliteal vein. At this point, in the popliteal fossa, the vein is anatomically posterior, though it is closer to the skin and, thus, appears more superficial when imaged by an US probe placed in the popliteal fossa. The lesser saphenous, a superficial vein, inserts in the popliteal vein in the mid- to proximal portion.

As the popliteal vein continues distally, the anterior tibial vein is the first branch, which then runs in the anterior tibial compartment adjacent to the interosseous membrane. Following take-off of the anterior tibial vein, the popliteal vein bifurcates into the peroneal and posterior tibial veins. The anterior tibial, posterior tibial, and peroneal veins are considered deep calf veins.

## Ultrasound Interrogation

The array of options included for US evaluation of the lower extremities includes: B-mode visualization of clot formation and compressibility, color flow and duplex imaging, and indirect measures such as response to respiration, valsava, and augmentation maneuvers.

A complete ultrasound of the deep venous system includes evaluation of the common femoral, superficial femoral, popliteal, and calf veins.<sup>5</sup> In practice, the evaluation of calf veins distal to the bifurcation of the popliteal vein frequently is omitted.<sup>2,6,7</sup> Calf veins may be imaged with the aid of color flow Doppler, but sensitivity is variable and detection requires a significant increase in the time for performance of the study.<sup>2,4,8</sup> While treatment of isolated calf vein thrombosis is controversial, the poor sensitivity of US for calf vein thrombosis should be noted, as up to 20% of calf vein thromboses may propagate proximally.<sup>9</sup> This is the basis for the recommendation that a repeat US examination be performed at one week in patients with an initially negative examination who are judged to be at intermediate or high risk or who remain symptomatic.<sup>3,7,10</sup> However, isolated calf vein thrombosis has not been shown to cause fatal pulmonary embolism, and propagation invariably occurs before embolism.<sup>9</sup>

**Emergency Medicine Reports™** (ISSN 0746-2506) is published biweekly by American Health Consultants, 3525 Piedmont Road, N.E., Six Piedmont Center, Suite 400, Atlanta, GA 30305. Telephone: (800) 688-2421 or (404) 262-7436.

**Vice President/Group Publisher:** Brenda Mooney

**Editorial Group Head:** Valerie Loner

**Specialty Editor:** Shelly Morrow

**Marketing Manager:** Schandale Kornegay

**GST Registration No.:** R128870672

Periodicals postage paid at Atlanta, GA. **POSTMASTER:** Send address changes to **Emergency Medicine Reports**, P.O. Box 740059, Atlanta, GA 30374.

Copyright © 2003 by American Health Consultants, Atlanta, GA. All rights reserved. Reproduction, distribution, or translation without express written permission is strictly prohibited.

**Back issues:** \$29. Missing issues will be fulfilled by customer service free of charge when contacted within one month of the missing issue's date.

**Multiple copy prices:** One to nine additional copies, \$325 each; 10 to 20 additional copies, \$287 each.

## Accreditation

**Emergency Medicine Reports™** continuing education materials are sponsored and supervised by American Health Consultants. American Health Consultants designates this continuing education activity for up to 60 hours in Category 1 credit toward the AMA Physician's Recognition Award. Each physician should claim only those hours of credit that he/she actually spent in the educational activity.

This CME activity was planned and produced in accordance with the ACCME Essentials.

**Emergency Medicine Reports™** also is approved by the American College of Emergency Physicians for 60 hours of ACEP Category 1 credit and has been approved for 52 Category 2B credit hours by the American Osteopathic Association. Emergency Medicine

**THOMSON**

**AMERICAN HEALTH CONSULTANTS**

## Statement of Financial Disclosure

In order to reveal any potential bias in this publication, and in accordance with Accreditation Council for Continuing Medical Education guidelines, we disclose that Drs. Moore (author), Macasaet, and Butler (peer reviewers) report no relationships with companies related to the field of study covered by this CME program. Dr. Lambert (author) is president of Windy City Ultrasound Inc., an ultrasound education company. Dr. Bosker (editor) is on the speaker's bureau for Pfizer, Rhone-Poulenc Rorer, and Parke-Davis. Dr. Bosker also acknowledges that he receives royalties, commissions, and other compensation relating to the sale of textbooks, reprints of articles, and other written materials to the following pharmaceutical companies: Pfizer, Genentech, Aventis, Pharmacia, and Bayer.

## Subscriber Information

**Customer Service: 1-800-688-2421**

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

**Editorial E-Mail:** shelly.morrow@ahcpub.com

**World Wide Web page:** <http://www.ahcpub.com>

## Subscription Prices

1 year with 60 ACEP/60 AMA/60 AAFP

Category 1/Prescribed credits

(52 AOA Category 2B credits): \$524

1 year without credit: \$379

Resident's rate \$189.50

All prices U.S. only.

U.S. possessions and Canada, add \$30 plus applicable GST. Other international orders, add \$30.

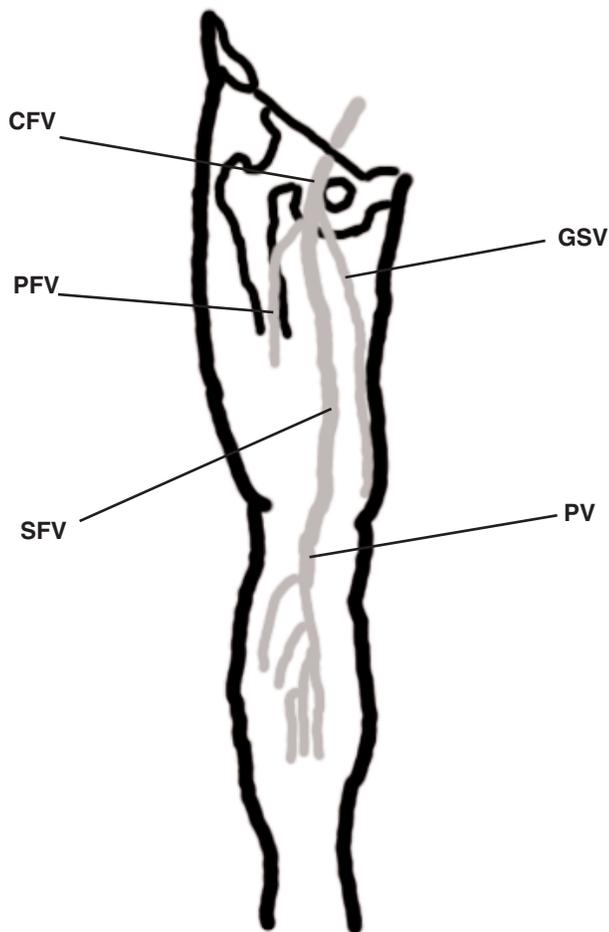
Reports has been reviewed by the American Academy of Family Physicians as having educational content acceptable for Prescribed credit hours. This volume has been approved for up to 60 Prescribed credit hours. Term of approval covers issues published within one year from the beginning distribution date of 1/03. Credit may be claimed for one year from the date of this issue. American Health Consultants (AHC) is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

This is an educational publication designed to present scientific information and opinion to health professionals, to stimulate thought, and further investigation. It does not provide advice regarding medical diagnosis or treatment for any individual case. It is not intended for use by the layman. Opinions expressed are not necessarily those of this publication. 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 for specific situations.

## For Customer Service and CME questions,

Please call our customer service department at (800) 688-2421. For editorial questions or comments, please contact **Shelly Morrow**, Specialty Editor, at [shelly.morrow@ahcpub.com](mailto:shelly.morrow@ahcpub.com) or (404) 262-5514.

**Figure 1. Schematic Drawing of Lower Extremity Vascular Anatomy**



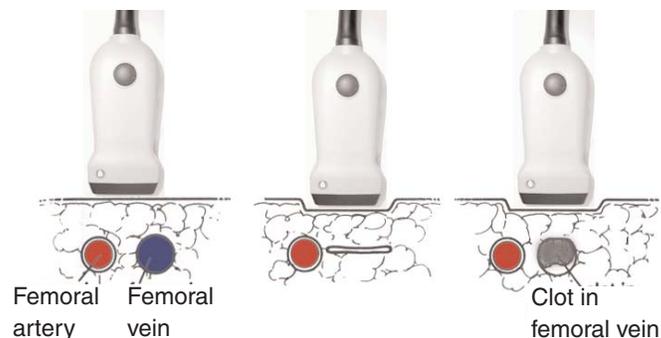
**Key:** CFV = common femoral vein; GSV = great saphenous vein; SFV = superficial femoral vein; PFV = profunda femoral vein; PV = popliteal vein

All images in this issue courtesy of Michael J. Lambert, MD.

The most reliable component of the US examination for DVT has been found to be compression ultrasonography. (See Figure 2.) Using a linear probe in the 5-7.5 MHz frequency range, the veins are interrogated from the anterior surface of the thigh along their length at 2-3 cm intervals in the transverse (and occasionally longitudinal) planes. (See Figure 3.) Gentle compression (see Figure 4) along the vein should cause the clot-free vein to collapse completely. The corresponding B-mode (also known as 2-D or gray-scale) image is displayed on the ultrasound monitor screen. (See Figures 5 and 6.) Absence of compression (vein walls fail to contact with adequate compression over vessel) indirectly indicates the presence of a clot in the lumen. (See Figure 7.) Occasionally, a clot may be visualized directly as a slightly hyperechoic image in the lumen, a specific but not sensitive sign of a clot. (See Figure 8.) Typically, the thigh is evaluated with the patient supine, and the popliteal vessels with either the knee bent slightly or the patient in a decubitus or prone position. (See Figure 9.)

The literature has demonstrated that it is reasonably safe to withhold anticoagulation therapy from patients with a negative

**Figure 2. Schematic of Left Common Femoral Vein—Compressed**



**Figure 3. Transverse Plane**



This image shows a 6.5 MHz linear probe positioned in transverse scanning plane at the level of the common femoral vein.

compression US. In a study of 1022 patients with normal compression US (common femoral to popliteal veins evaluated) followed for more than eight months, three patients returned with DVT and two died from pulmonary embolism.<sup>7</sup>

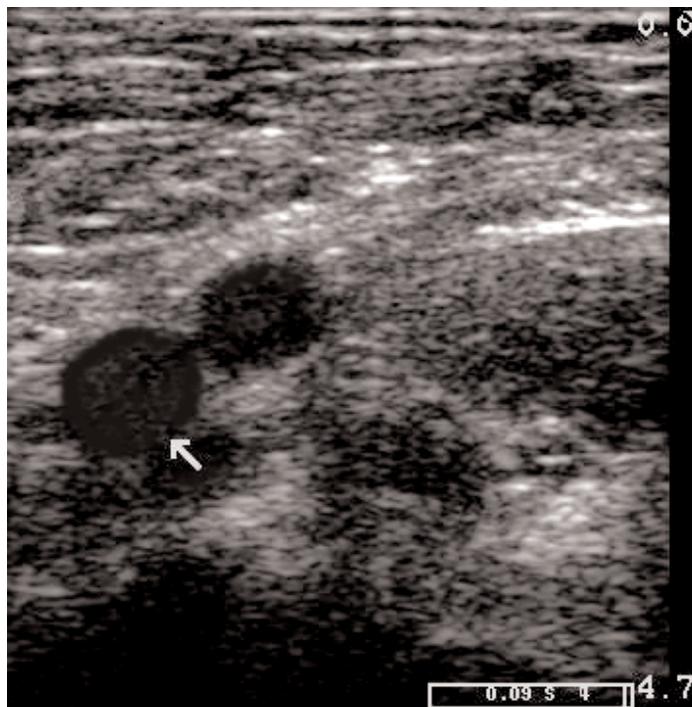
Whether the use of compression US of the lower extremities can be abbreviated to include only the common femoral and popliteal veins is controversial. This is considered a “limited compression ultrasound,” and thus does not include the superficial femoral vein. Post-mortem and venography studies have shown that DVT appears invariably to involve the common femoral vein or the popliteal vein, and does not occur as an isolated superficial femoral vein clot.<sup>11</sup> With this in mind, one study

**Figure 4. Left Common Femoral Vein—Compressed**



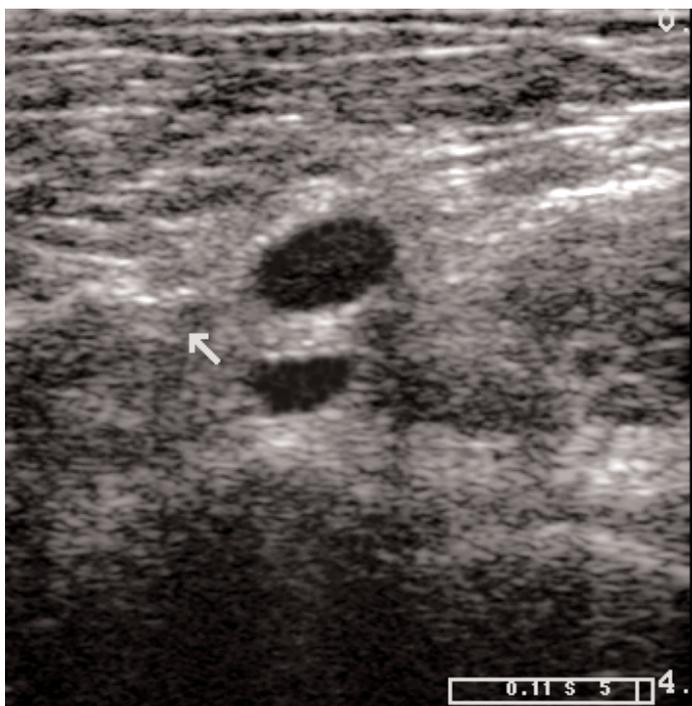
6.5 MHz linear probe—positioned in transverse scanning plane at the level of the common femoral vein with gentle compression applied.

**Figure 5. Left Common Femoral Vein—Uncompressed**



White arrow reveals an uncompressed left common femoral vein.

**Figure 6. Left Common Femoral Vein—Compressed**



White arrow indicates position of compressed left common femoral vein.

showed an accuracy of 100% and a decrease in the time to perform the US by 9.7 minutes or 54% when using the abbreviated method.<sup>12</sup> However, a larger, prospective US study of 755 patients reported six clots isolated to the superficial femoral veins (4.6% of all patients with DVT, 0.8% of all patients studied) and concluded that abbreviating the examination would sacrifice diagnostic accuracy unacceptably.<sup>13</sup> However, this study included all patients referred for US for any reason (i.e., asymptomatic after surgery). The incidence and prognosis of isolated common femoral vein thrombosis in a population of symptomatic ED patients is not known.

The addition of Doppler frequently is used to enhance visualization and diagnosis of a deep venous clot. Doppler is a term that encompasses the use of US in the evaluation of a moving target, in this case blood in the venous system, and includes color flow and spectral or “duplex” Doppler.

Color flow Doppler is the representation of flow toward or away from the transducer using red and blue. A normal clot-free vein will fill with color throughout the lumen in a phasic manner. The use of color flow may help to localize difficult-to-find vessels in uncooperative or obese patients, and may detect a clot in areas that are difficult to compress, such as at the inguinal ligament or where the superficial femoral vein passes through the adductor canal. Presence of a clot is identified

**Figure 7. Absence of Compression**



Right superficial femoral vein. Inability to collapse vein indirectly indicates presence of clot in lumen.

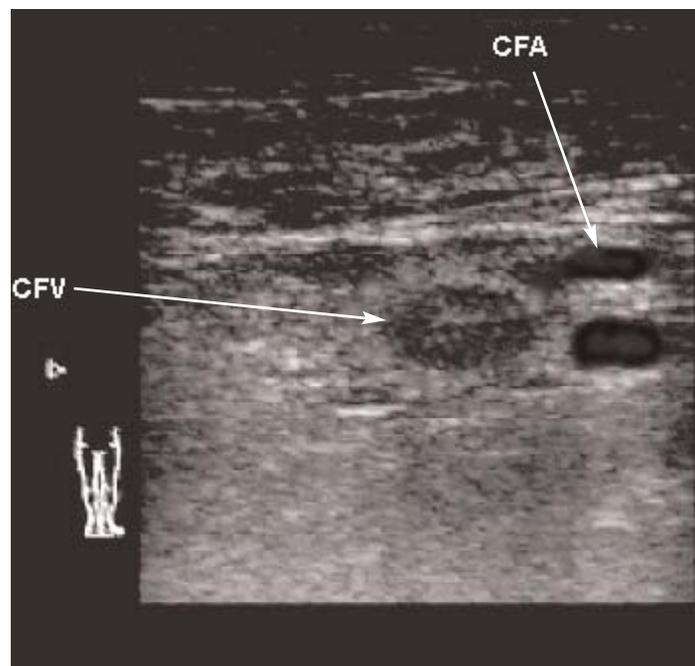
when a luminal filling defect occurs. (See Figure 10.) While the use of color flow typically is a complementary technique to compression ultrasonography, it has been validated as an independent modality.<sup>14</sup>

Spectral Doppler is a modality that can quantify flow velocity and typically is represented with time on the x-axis and velocity (positive or negative) on the y-axis. (See Figure 11.) It is called duplex because both the B-mode image and the spectral Doppler waveform are displayed simultaneously. Use of pulsed wave Doppler allows selection of a sample volume (gated volume) on the B-mode image that then is represented on a separate part of the screen. In patients who are free of clot, spontaneous flow variation should be evident at rest and should show phasic variation with respiration, valsalva, or squeezing of the distal calf veins (augmentation). Valsalva also should cause an increase of 50% or greater in the size of the common femoral vein on B-mode imaging. Absence of these with normal direct compressibility is evidence of a clot either proximal or distal to the area being evaluated. (See Figures 12 and 13.) While the use of duplex may enhance the US evaluation, it rarely is used alone to diagnose DVT without other direct signs by compression or color-flow examination.<sup>2</sup>

### Ultrasound by EPs for DVT

The majority of the literature, and that discussed above, is based on the evaluation for DVT in a vascular laboratory with a full array of machines, trained sonographers, and physicians

**Figure 8. Hyperechoic Clot in Left Common Femoral Vein**



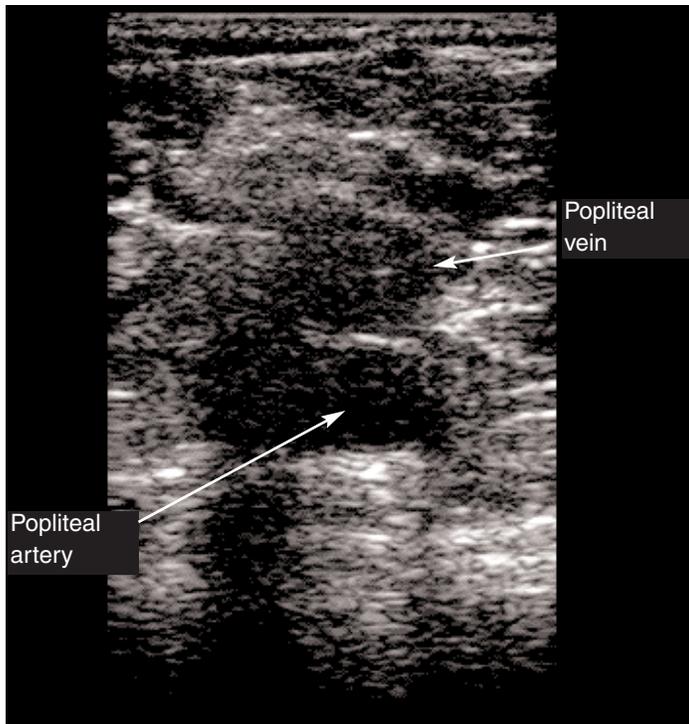
Left common femoral vein (CFV) with hyperechoic lumen in comparison to common femoral artery (CFA) (partially compressed).

**Figure 9. Probe Positioning for Popliteal Vessels**



skilled in US interpretation. In an ideal world, all of this would be available to the EP on an immediate and inexpensive basis. While many hospitals maintain such resources on an on-call basis 24 hours per day, seven days per week, in even the best situation evaluation for DVT in off-hours is time-consuming and resource intensive, if it is available at

**Figure 10. Popliteal Artery and Vein**



**Figure 11. Color Flow Doppler of Left Common Femoral Vein Thrombosis**



Left common femoral vein with color flow Doppler. Luminal filling defect occurs in CFV while CFA reveals flow.

all.<sup>15</sup> This raises the question of the performance of US for DVT by EPs.

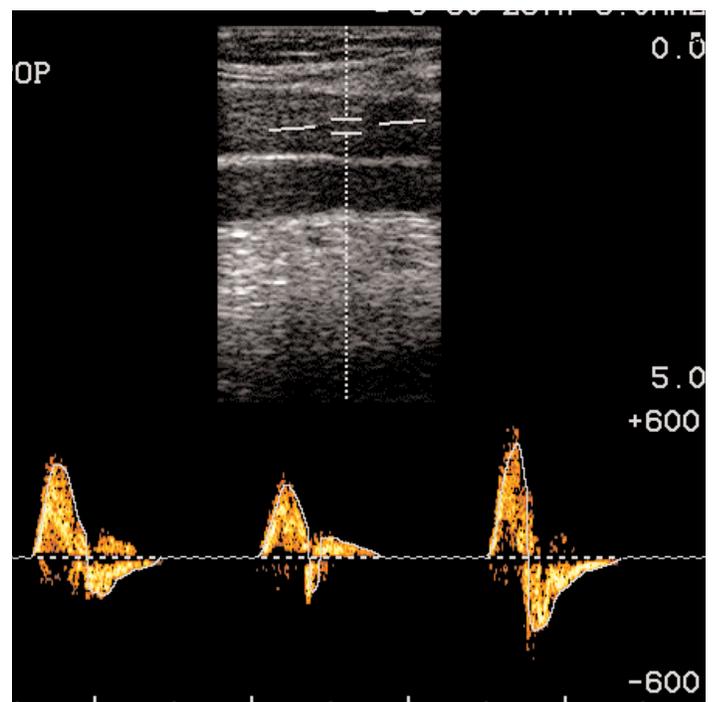
The literature for ultrasonographic detection of DVT by EPs is not extensive. A 1990 study described the use of a handheld Doppler stethoscope by EPs and described a sensitivity of 85% with a specificity of 79% compared with venography, although there were a high number of equivocal studies that were not included in the analysis.<sup>16</sup> This technique is highly operator-dependent and retains only historical significance.<sup>2</sup>

Another study investigated the training and performance of lower extremity US by two EPs during off-hours.<sup>17</sup> Following training with the radiology department, these physicians studied 15 patients and found a 100% sensitivity and a 75% specificity based on follow up radiology results. Time to complete the examination was not noted.

A study in 2000 consisted of 112 patients who were evaluated in the ED for suspected DVT. EPs performed compression ultrasonography of the femoral and popliteal veins, with assistance from color flow Doppler and augmentation maneuvers (i.e., squeezing the calf). Thirty-four patients were found to have DVT, and results were found to have excellent agreement with vascular laboratory US studies completed within eight hours (kappa of 0.9, 98% agreement). Median time for EPs to complete the study was 3 minutes 28 seconds. Limitations included lack of a true gold standard and limited long term follow-up for outcome based on EP diagnosis.<sup>15</sup>

Studies such as this suggest that the EP may be able to utilize US quickly and effectively for the majority of patients pre-

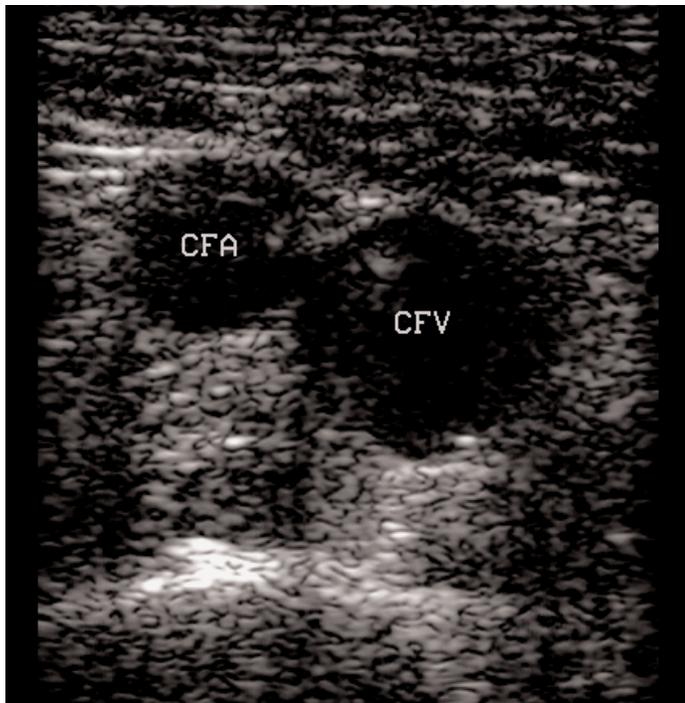
**Figure 12. Spectral Doppler of Left Popliteal Vein**



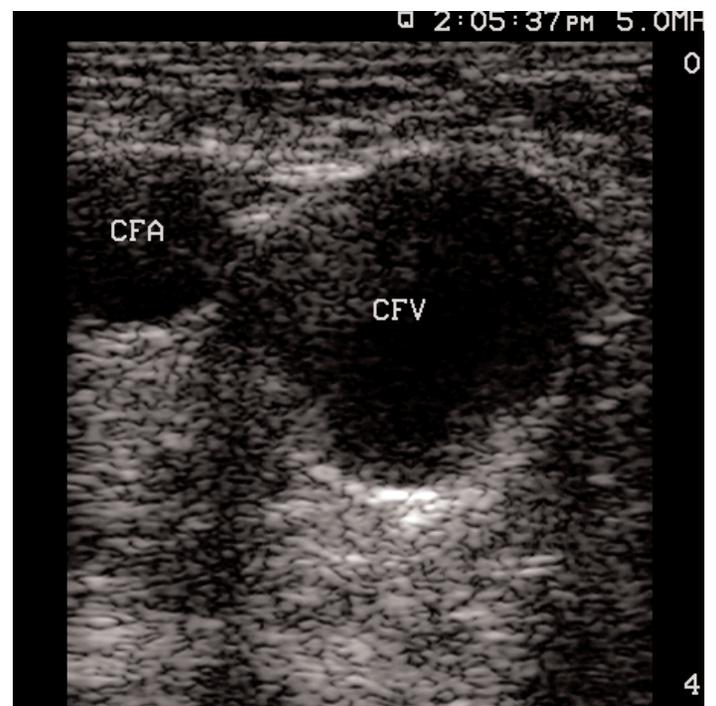
Spectral Doppler is a modality that can quantify flow velocity.

sented with symptoms of DVT. In even the best circumstances, US is not a perfect test for DVT. It is reasonable to suppose that the judicious use of US by EPs in addition to close follow-up could be helpful in the evaluation of DVT in the ED.

**Figure 13. Common Femoral Vein: Pre-Valsalva**



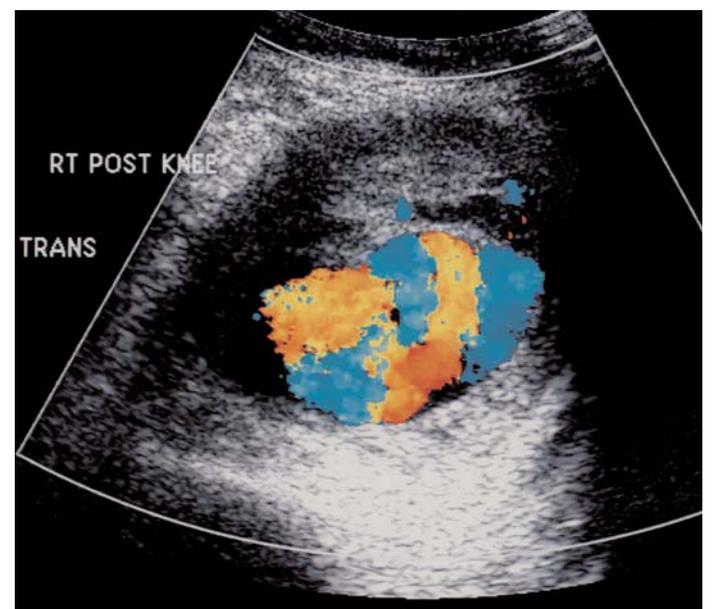
**Figure 14. Common Femoral Vein: Valsalva**



**Figure 15. Baker's Cysts**



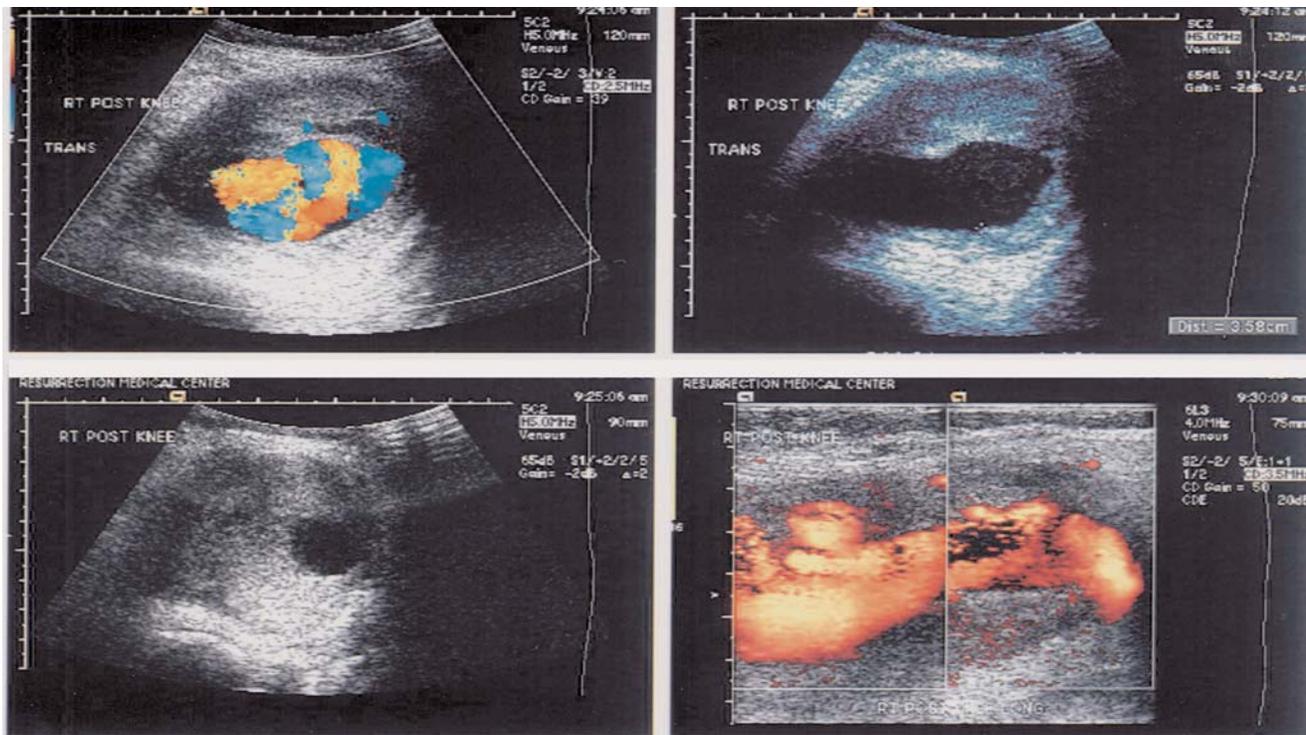
**Figure 16. Popliteal Artery Aneurysms**



Recently, studies have suggested that D-dimer may be used in the assessment of DVT with a high degree of negative predictive value,<sup>6</sup> and is especially good when paired with low pre-test probability.<sup>10,18</sup> In addition, the use of pretest probability paired with a negative US may reliably exclude DVT.<sup>3</sup> It is possible that the performance of compression US for DVT by the EP in conjunction with clinical suspicion or a test such as D-dimer could be used to safely withhold anticoagulant therapy, although this awaits prospective validation.

In addition to the evaluation of DVT per se, US of the lower extremities may play a role in the emergent evaluation of patients presenting with suspected pulmonary embolism (PE), especially those in extremis. While as many as 29% of patients with documented PE have no DVT on venography,<sup>2</sup> the presence of DVT by ultrasound provides evidence that a symptomatic patient has suffered a PE, and provides validation for the use of heparin or even thrombolytics in the unstable patient with a high clinical

**Figure 17. Popliteal Artery Aneurysms**



suspicion. Frazee and Snoey have recommended the combination of emergent transthoracic echocardiography with DVT for the patient suspected to have suffered a massive PE.<sup>1</sup>

It also should be noted that US, either done in radiology or by the EP, may reveal an alternate diagnosis when DVT is suspected. Popliteal or Baker's cysts (See Figure 15) appear as smooth, walled, echo-free masses located medially in the popliteal fossa, occasionally with septations.<sup>19</sup> Popliteal artery aneurysms (See Figure 16) occur when the vessel exceeds a diameter of 1.1 cm, and appear as an echo-free mass located centrally in the popliteal fossa continuous with the popliteal artery. Doppler may establish flow in the aneurysm (See Figure 17), although presence of clot (more echogenic) may eliminate flow.<sup>19</sup> Other diagnoses that may be made by US include abscesses, hematomas, tumors, lymphadenopathy, and muscular or tendinous inflammation.<sup>20</sup>

### Conclusion

US, and specifically compression ultrasonography, is the diagnostic test of choice for evaluation of the ED patient with suspected DVT. As with any skill, there is a learning curve, and the performance of US for DVT by EPs should be approached judiciously. Knowledge of the technique, however, may provide a tool that is otherwise unavailable in a timely manner. In any case, knowledge of the performance and limitations of lower extremity US will improve diagnosis and treatment of this important disease.

### References

1. Frazee BW, Snoey ER. Diagnostic role of ED ultrasound in deep

venous thrombosis and pulmonary embolism. *Am J Emerg Med* 1999;17:271-278.

2. Cronan JJ. Venous thromboembolic disease: The role of US. *Radiology* 1993;186:619-630.
3. Wells PS, Anderson DR, Bormanis J, et al. Value of assessment of pretest probability of deep-vein thrombosis in clinical management. *Lancet* 1997;350:1795-1798.
4. Lewis BD. The peripheral veins. In: Rumack CM, Wilson SR, Charboneau JW, eds. *Diagnostic Ultrasound*. St. Louis, MO; Mosby 1998: 943-958.
5. AIUM Standards for performance of the vascular/Doppler ultrasound examination. 1992. <http://www.aium.org/consumer/standards/vascular.asp>.
6. Birdwell B. Recent clinical trials in the diagnosis of deep-vein thrombosis. *Curr Opin Hematol* 1999;6:275-279.
7. Vaccaro JP, Cronan JJ, Dorfman GS. Outcome analysis of patients with normal compression US examinations. *Radiology* 1990;175: 645-649.
8. Rose SC, Zwiebel WJ, Nelson BD, et al. Symptomatic lower extremity deep venous thrombosis: Accuracy, limitations, and role of color duplex flow imaging in diagnosis. *Radiology* 1990; 175: 639-644.
9. Philbrick JT, Becker DM. Calf deep venous thrombosis. *Arch Int Med* 1998;148:2131-2138.
10. Lensing AWA, Prandoni P, Prins MH, et al. Deep-vein thrombosis. *Lancet* 1999;353:479-485.
11. Cogo A, Lensing A, Prandoni P, et al. Distribution of thrombosis in patients with symptomatic deep vein thrombosis. *Arch Int Med* 1993;153:2777-2780.

12. Pezzullo JA, Perkins AB, Cronan JJ. Symptomatic deep vein thrombosis: diagnosis with limited compression US. *Radiology* 1996; 198:67-70.
13. Frederick MG, Hertzber BS, Kliever MA, et al. Can the US examination for lower extremity deep venous thrombosis be abbreviated? A prospective study of 755 examinations. *Radiology* 1996;199: 45-47.
14. Lewis BD, James EM, Welch TJ, et al. Diagnosis of acute deep venous thrombosis of the lower extremities: Prospective evaluation of color Doppler flow imaging versus venography. *Radiology* 1994; 192:651-655.
15. Blaivas M, Lambert MJ, Harwood RA, et al. Lower-extremity Doppler for deep venous thrombosis—can emergency physicians be accurate and fast? *Acad Emerg Med* 2000;7:120-126.
16. Turnbull TL, Dymowski JJ, Zalut TE. Prospective study of handheld Doppler ultrasonography by emergency physicians in the evaluation of suspected deep vein thrombosis. *Ann Emerg Med* 1990; 19:691-695.
17. Jolly BT, Massarin E, Pigman EC. Color Doppler ultrasonography by emergency physicians for the diagnosis of acute deep venous thrombosis. *Acad Emerg Med* 1997; 4:129-132.
18. Anderson DR, Wells PS, Stiell I, et al. Management of patients with suspected deep vein thrombosis in the emergency department: Combining use of a clinical diagnosis model with D-dimer testing. *J Emerg Med* 2000;19:225-230.
19. Pathria MN, Zlatkin M, Sartoris DJ, et al. Ultrasonography of the popliteal fossa and lower extremities. *Radiol Clin N Am* 1988; 26:77-85.
20. Pini M, Marchini L, Giordano A. Diagnostic strategies in venous thromboembolism. *Haematologica* 1999;84:535-540.

### Physician CME Questions

11. Which of the following is *not* part of the deep venous system?
  - A. Greater saphenous vein
  - B. Superficial femoral vein
  - C. Popliteal vein
  - D. Anterior tibial vein

12. Which veins are *not* easily assessed using ultrasound evaluation?
  - A. Iliac vein
  - B. Deep femoral vein
  - C. Calf veins
  - D. All of the above
13. What is the sensitivity of ultrasound for DVT in an asymptomatic post-op patient?
  - A. 59%
  - B. 72%
  - C. 85%
  - D. 95%
14. What percentage of calf vein thrombosis will propagate proximally?
  - A. Less than 5%
  - B. 10 %
  - C. Up to 20%
  - D. 40%
15. Which modality of diagnosing DVT with ultrasound is the most reliable?
  - A. Duplex Doppler assessment
  - B. B-mode compressibility
  - C. Color-flow Doppler
  - D. Phasic variation with respiration
16. Limited compression ultrasound refers to assessment of which vessel?
  - A. Common femoral vein only
  - B. Common and superficial femoral veins
  - C. Common femoral and popliteal veins
  - D. Common femoral, superficial femoral, and popliteal veins
17. The recommendation for patients with a negative initial ultrasound and persistent symptoms does *not* include:
  - A. empiric anticoagulation.
  - B. repeat ultrasound at 1 week.
  - C. venography.

### Immediate CME certificate delivery



#### The Global Continuing Medical Education Resource

Exciting **site improvements** include advanced search capabilities, more bulk purchasing options, certificate printing, and much more. With **more than 1100 hours** of credit available, keeping up with your CME has never been easier! Your test will be graded instantly online and your certificate will be delivered via e-mail.

### Choose your area of clinical interest

- AIDS/HIV
- Alternative Medicine
- Asthma
- Cardiology
- Contraception
- Critical Care
- Diabetes
- Emergency Medicine
- Geriatrics
- Infection Control
- Internal Medicine
- Medical Ethics
- Neurology
- OB/GYN
- Oncology
- Pediatrics
- Primary Care
- Psychiatric Medicine
- Radiology
- Sports Medicine
- TB
- Therapeutics
- Travel Medicine

#### Price per Test

As low as \$5 per test with bulk purchase option.

[www.CMEweb.com](http://www.CMEweb.com)

CALL **1-800-688-2421** OR E-MAIL  
CUSTOMERSERVICE@CMEWEB.COM

- D. Both B and C
18. What percentage of patients with proven PE do *not* have DVT by venography?
- A. Fewer than 7%
- B. 12%
- C. 19%
- D. Up to 29%
19. Approximately how many people develop DVT in their lifetimes?
- A. 1 in 10
- B. 1 in 20
- C. 1 in 50
- D. 1 in 100
20. Post-mortem and venography studies have shown that DVT appears

- invariably to involve the common femoral vein or the popliteal vein.
- A. True
- B. False

### Correction

The *Emergency Medicine Reports* issue from Nov. 18, 2002, (volume 23 number 24) included an incorrect statement. The sentence on page 296 should read, "In general digital nerves are repaired only when damaged proximal to the DIP, as spontaneous regeneration and overlap from the opposite side usually provide good results without surgery."

*Another value-added feature  
FREE to subscribers*

# EMRonline.com

This continuously updated online service gives you expanded access to patient care tools, including the popular Rapid Access Management Guideline cards, objective information on more than 4,000 prescription drugs through a convenient link to PDR.net, a forum for consulting with your colleagues on difficult-to-diagnose cases—an immediately useful clinical data repository.

**LOG ON NOW!**

# EMRonline.com

Or call 1-800-688-2421.  
Outside the U.S. 404-262-5476.

**In Future Issues:**

**Ultrasound in the ED,  
Part III**

### *Emergency Medicine Reports*

#### CME Objectives

*To help physicians:*

- quickly recognize or increase index of suspicion for specific conditions;
- understand the epidemiology, etiology, pathophysiology, and clinical features of the entity discussed;
- be educated about how to correctly perform necessary diagnostic tests;
- take a meaningful patient history that will reveal the most important details about the particular medical problem discussed;
- apply state-of-the-art therapeutic techniques (including the implications of pharmaceutical therapy discussed) to patients with the particular medical problems discussed;
- understand the differential diagnosis of the entity discussed;
- understand both likely and rare complications that may occur;
- and provide patients with any necessary discharge instructions.

# Trauma Reports

Vol. 4, No. 1

Supplement to *Emergency Medicine Reports, Pediatric Emergency Medicine Reports, ED Management, and Emergency Medicine Alert*

Jan./Feb. 2003

*In critical situations, the management of the airway is paramount. Virtually all algorithms begin with attention to and protection of the airway. In a patient with a traumatic injury, airway management assumes an essential role to stabilization and survival of the patient, but often presents unique challenges not inherent in other types of patients. The skill of the intubator is put to the ultimate test in the trauma patient, whose airway often is compromised by multiple complicating factors, including hemodynamic instability from multiorgan injury, cervical spine fractures, and direct trauma to the airway.*

*The process of airway management has evolved considerably to include sophisticated techniques and pharmacologic adjuncts. This two-part article will review the concepts of airway management in the trauma patient, the technique of rapid sequence intubation (RSI), and adjuncts to assist with the management of the difficult or failed airway.*

—The Editor

## The Trauma Airway

The airway in the trauma patient can present many challenges, even for the experienced clinician. These factors can

occur individually or together to complicate the care of the trauma patient. (See Table 1.)

**Preexisting Difficult Airway.** As everyone who works in the field of emergency medicine knows, Murphy's Law virtually

defines our existence—if something can go wrong, it will. Inevitably, a neckless, 375-pound man with advanced ankylosing spondylitis who is driving a compact car will have an unfortunate encounter with a tractor-trailer at 3 a.m. and be transported to your facility as a Level 1 trauma. As you prepare to perform the intubation, you realize that multiple previous airway manipulations have significantly altered the anatomy in the posterior pharynx.

Patients will bring to the trauma room preexisting anatomical variations that can complicate endotracheal intubation (ETI). In any patient who is not critical enough to require an immediate airway intervention, it is imperative to conduct a thorough evaluation as possible before considering the use of a paralytic agent. The ultimate rule of airway management is to have a thoroughly prepared plan to deal with the patient's airway, and never paralyze a patient you suspect will be extremely difficult or impossible to intubate. Further, the ability

## Current Strategies for Airway Management in the Trauma Patient

**Authors:** **Colin G. Kaide, MD, FACEP, FAAEM**, Assistant Professor of Emergency Medicine, Department of Emergency Medicine, The Ohio State University, Columbus; **Jason C. Hollingsworth, MD**, Emergency Medical Staff Physician, Community Hospital of Indianapolis, Indianapolis, IN.

**Peer Reviewer:** **Perry W. Stafford, MD, FACS, FAAP, FCCM**, Chief of Trauma and Surgical Critical Care, Associate Professor of Pediatric Surgery, Department of Pediatric General and Thoracic Surgery, Children's Hospital of Philadelphia, PA.

Now available online at [www.ahcpub.com/online.html](http://www.ahcpub.com/online.html) or call (800) 688-2421 for more information.

**EDITOR IN CHIEF**

**Ann Dietrich, MD, FAAP, FACEP**  
Associate Clinical Professor  
Ohio State University  
Attending Physician  
Columbus Children's Hospital  
Associate Pediatric Medical Director  
MedFlight  
Columbus, Ohio

**EDITORIAL BOARD**

**Mary Jo Bowman, MD**  
Associate Professor of Clinical Pediatrics  
Ohio State University College of Medicine  
Attending Physician, Children's Hospital of Columbus  
Columbus, Ohio

**Larry N. Diebel, MD**  
Associate Professor of Surgery  
Detroit Medical Center  
Wayne State University  
Detroit, Michigan

**Robert Falcone, MD**

Senior Operations Officer  
Grant Medical Center  
Columbus, Ohio

**Theresa R. Finerty, RN, MS**

Director, Emergency/Trauma Services  
OSF St. Francis Medical Center  
Peoria, IL

**Dennis Hanlon, MD**

Director  
Emergency Medicine Residency Program  
Assistant Professor of Emergency Medicine  
Allegheny General Hospital  
Pittsburgh, Pennsylvania

**Robert Jones, DO, FACEP**

Emergency Ultrasound Coordinator  
OUCOM/Doctor's Hospital Emergency Medicine  
Residency Program  
Attending Physician  
MetroHealth Medical Center  
Cleveland, Ohio

**S.V. Mahadevan, MD, FACEP**

Assistant Professor of Surgery  
Associate Chief, Division of Emergency Medicine  
Stanford University School of Medicine  
Stanford, California

**Ronald M. Perkin, MD, MA, FAAP, FCCM**

Professor and Chairman, Department of Pediatrics  
Brody School of Medicine at East Carolina University  
Medical Director  
Children's Hospital University Health Systems of Eastern Carolina  
Greenville, North Carolina

**Steven A. Santanello, DO**

Medical Director  
Trauma Services  
Grant Medical Center  
Columbus, Ohio

**Eric Savitsky, MD**

Assistant Professor of Medicine  
Emergency Medicine/Pediatric Emergency Medicine  
UCLA Emergency Medicine Residency Program  
Los Angeles, California

**Perry W. Stafford, MD, FACS, FAAP, FCCM**

Chief of Trauma and Surgical Critical Care  
Associate Professor of Pediatric Surgery  
Department of Pediatric General and Thoracic Surgery  
Children's Hospital of Philadelphia, PA.

© 2003 American Health Consultants  
All rights reserved

to adequately mask ventilate should be taken into consideration when deciding upon the type and method of airway intervention. Characteristics of patients who may be difficult to mask ventilate or intubate are discussed in detail in the "Difficult Airway" section.<sup>1-5</sup>

**Trauma Immobilization.** The physical process of trauma immobilization with a cervical collar and backboard significantly can limit access to the airway and the anterior neck. A properly placed collar inhibits opening of the mouth and, by intention, prevents repositioning of the head and neck. The collar further can obstruct visualization of the anterior neck and potentially lead one to miss laryngeal trauma or distortion of airway anatomy.

It is essential, therefore, to remove the cervical collar and utilize inline stabilization by a dedicated individual during attempts at intubation.

**Cervical Spine Considerations.** As in virtually all trauma cases, careful consideration must be given to potential injury to

## Table 1. Potential Complicating Factors in the Management of a Trauma Patient's Airway

- Pre-existing difficult airway (i.e., anterior larynx, short neck, poor jaw mobility, etc.)
- Physical constraints of trauma immobilization
- Potential or actual injuries to the cervical spine
- Mechanical distortion of the airway anatomy from direct trauma to oral, pharyngeal, or laryngeal structures
- Mechanical distortion of the airway from injuries to contiguous structures (lower neck, thorax, or trachea)
- Other non-airway factors, such as hypotension, brain injury, or pneumothorax, which compete with the urgency to control the airway

the cervical spine and spinal cord. This stated, however, airway management still remains at the top of the resuscitation algorithm. Failure to adequately control an airway due to theoretical concerns of cervical injury violates this standard. The emergency physician charged with the task of securing an airway must employ the best possible available techniques to maintain cervical stability and utilize refined intubation skills while not sacrificing the patient for protection of his spinal cord.

**Mechanical Distortion of the Airway or of Contiguous Structures.** Direct trauma to the face, larynx, or thorax can alter the normal anatomic relationships of the airway structures and can increase the difficulty of intubation.

### Indications for Invasive Airway Intervention

The decision to intubate a patient in the emergency department (ED) can be the most significant and definitive step in the care of the trauma patient. The primary goals of intubation are to improve gas exchange, relieve respiratory distress by decreasing the work of breathing, and protect against aspiration. Secondary goals range from intentional hyperventilation to core rewarming.

Experienced clinicians will be familiar with the intubation criteria listed in Table 2.<sup>6</sup>

**Respiratory Failure.** Respiratory failure occurs when a patient is unable to oxygenate or ventilate adequately to meet his/her physiologic needs. The decision to intervene is based on abnormalities found on blood gas analysis and, often more importantly, the clinician's observation of the patient in respiratory distress.

Oxygenation failure often is defined as the inability to maintain a PaO<sub>2</sub> of 60 mmHg on an FiO<sub>2</sub> greater than 40%.

**Ventilation Failure.** The best indicator of hypoventilation is an abnormal pH. A pH less than 7.3 resulting from hypoventilation should prompt intervention. Intervention at a higher pH may be necessary if the patient appears fatigued or has significant comorbidity. Chronic compensated elevation in PaCO<sub>2</sub> does not require support. When making a decision based on abnormal blood gas analysis, carbon dioxide retention with a PaCO<sub>2</sub> greater than 55 (with previously normal PaCO<sub>2</sub>) or rise in PaCO<sub>2</sub> by 10 acutely in chronic obstructive pulmonary disease (COPD) is an indication for intervention.

**Trauma Reports™** (ISSN 1531-1082) is published bimonthly by American Health Consultants, 3525 Piedmont Road, N.E., Six Piedmont Center, Suite 400, Atlanta, GA 30305. Telephone: (800) 688-2421 or (404) 262-7436.

**Vice President/Group Publisher:** Brenda Mooney  
**Editorial Group Head:** Valerie Loner  
**Managing Editor:** Allison Mechem  
**Marketing Manager:** Schandale Kornegay  
 Periodicals postage paid at Atlanta, GA.  
 (GST registration number R128870672.)

**POSTMASTER:** Send address changes to **Trauma Reports**, P.O. Box 740059, Atlanta, GA 30374. Copyright © 2003 by American Health Consultants, Atlanta, GA. All rights reserved. Reproduction, distribution, or translation without express written permission is strictly prohibited.

### Accreditation

**Trauma Reports™** continuing education materials are sponsored and supervised by American Health Consultants. American Health Consultants designates this continuing education activity for up to 2.5 hours in Category 1 credit toward the AMA Physician's Recognition Award. Each physician should claim only those hours of credit that he/she actually spent in the educational activity. This CME activity was planned and produced in accordance with the ACCME Essentials. Approved by the American College of Emergency Physicians for 2.5 hours of CEP Category 1 credit.

American Health Consultants (AHC) is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

**Trauma Reports®** is approved for approximately 2.5 nursing contact hours. This offering is sponsored by 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, Provider Number CEP 10864, for

approximately 2.5 contact hours. This program (#0105-1) has been approved by an AACN Certification Corp.-approved provider (#10852) under established AACN Certification Corp. guidelines for 2.5 contact hours, CERP Category A.

This is an educational publication designed to present scientific information and opinion to health professionals, to stimulate thought, and further investigation. It does not provide advice regarding medical diagnosis or treatment for any individual case. It is not intended for use by the layman. Opinions expressed are not necessarily those of this publication. 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 for specific situations.

The intended audience for this publication is emergency, family, osteopathic, and general practice physicians and nurses who have contact with trauma patients.

This continuing education activity expires January 31, 2004.

### Subscriber Information

#### Customer Service: 1-800-688-2421

**Customer Service E-Mail:** [customerservice@ahcpub.com](mailto:customerservice@ahcpub.com)  
**Editorial E-Mail:** [allison.mechem@ahcpub.com](mailto:allison.mechem@ahcpub.com)  
**World Wide Web page:** <http://www.ahcpub.com>

#### Subscription Prices

**FREE** to subscribers of *Emergency Medicine Reports*, *Pediatric Emergency Medicine Reports*, *Emergency Medicine Alert*, and *ED Management*.

For nonsubscribers, the price is \$199. U.S. possessions and Canada, add \$30 plus applicable GST. Other international orders, add \$30.

**Back issues:** \$66. One to nine additional copies, \$159 each; 10-20 additional copies, \$119 each.

#### For Customer Service,

Please call our customer service department at (800) 688-2421. For editorial questions or comments, please contact **Allison Mechem**, Managing Editor, at [allison.mechem@ahcpub.com](mailto:allison.mechem@ahcpub.com).

**THOMSON**  
  
**AMERICAN HEALTH CONSULTANTS**

### Statement of Financial Disclosure

In order to reveal any potential bias in this publication, and in accordance with Accreditation Council for Continuing Medical Education guidelines, Drs. Dietrich (editor in chief), Bowman, Diebel, Falcone, Finerty, Hanlon, Jones, Mahadevan, Perkin, Santanello, Savitsky (editorial board members), Stafford (editorial board member and peer reviewer), Kaide, and Hollingsworth (authors) report no relationships with companies related to the field of study covered by this CME program.

**Table 2. Indications for Intubation**

- Oxygenation failure— $\text{PaO}_2 < 60$  on  $\text{FiO}_2 > 40\%$
- Ventilation failure— $\text{pCO}_2 > 55$  with previously normal  $\text{pCO}_2$  or rise in  $\text{pCO}_2$  by 10 acutely in COPD
- Need for intentional hyperventilation
- Profound shock—Reduces energy expenditure used during rapid breathing
- Intentional paralysis—To accomplish necessary procedures in a non-compliant patient
- To protect the patient from aspiration
- To alleviate mechanical obstruction
- To perform core rewarming

**Respiratory Muscle Fatigue.** The increased work of breathing seen with decreases in lung compliance (e.g., pulmonary contusions, pulmonary edema, consolidation, pneumothorax, or atelectasis) and increases in airway resistance (e.g., bronchospasm or excessive airway secretions) can contribute to early fatigue of respiratory muscles. This can be seen clinically by agitation, diaphoresis, nasal flaring, the use of accessory muscles, and abdominal (seesaw motion) breathing. (See Table 3.)

**Intentional Hyperventilation.** Although this technique traditionally has been used to attenuate intracranial hypertension by inducing alkalosis to cause cerebral vasoconstriction, it recently has been shown to be appropriate in only limited situations.

**Cardiovascular Support.** Under normal physiologic conditions, energy expenditure for breathing is low. During states of physiologic stress, such as cardiogenic, hypovolemic, or septic shock, the oxygen demand of the pulmonary mechanism rises significantly. Early intervention with ETI in patients with significant hemodynamic compromise can improve oxygenation to the ischemic tissue and lessen myocardial workload.

**Aspiration Protection.** When a patient appears obtunded or lacks a gag reflex, ETI becomes vital to decrease the risk of aspiration and its attendant complications.

**Mechanical Obstruction.** Distortion of the airway can occur in a variety of traumatic injuries. In cases of impending airway obstruction or when obstruction already has occurred, the decision to intervene is a foregone conclusion.

With more subtle injury patterns, an airway may be intact at the time of initial examination, but the risk for potential obstruction can be very high. This situation is typified in the case of burns to the upper airway, where developing edema has the potential to completely obstruct the larynx and other posterior pharyngeal structures. Other examples include direct laryngeal trauma and penetrating wounds to the neck. Hematomas from injury to the carotid artery can expand and distort the airway beyond recognition.

**Core Rewarming.** A patient can develop substantial hypothermia as the result of a traumatic injury occurring during cold weather or secondary to submersion in cold water. As core temperature drops, many physiologic changes occur, resulting

**Table 3. Clues to Impending Respiratory Failure**

- Hoarseness of the voice
- Stridor
- Poor handling of secretions
- Agitation
- Falling pulse oximetry
- Progressive rise in end tidal  $\text{CO}_2$

in coagulopathy, hypotension, and an overall decrease in survival. The principles of core rewarming place significant value on the delivery of heated, humidified oxygen to the lungs as a major method of adding heat to the body.<sup>7</sup> This is best accomplished via the use of an endotracheal (ET) tube. Humidified oxygen is heated to  $45^\circ\text{C}$  ( $113^\circ\text{F}$ ) and delivered continuously. A rise in core temperature of  $1\text{--}2.5^\circ\text{C}$  ( $1.8\text{--}4.3^\circ\text{F}$ ) per hour can be expected. Contrary to widely held belief, intubation of a hypothermic patient never has precipitated the onset of a lethal arrhythmia.

### Rapid Sequence Intubation (RSI)

**Historical Perspective and Overview.** Prior to the emphasis on the development of controlled airway management strategies, airway management outside of the operating room (OR) was, to say the least, practiced with a particular lack of sophistication. Awake, non-pharmacologically assisted, oral intubation was common. Nasotracheal intubation also was utilized as a primary method of intubation or as a rescue technique. In the field, esophageal obturator airways were the standard modality.

If sedation became necessary, serial sedation frequently was utilized. This method used incremental doses of an opiate such as morphine, along with a benzodiazepine like diazepam or lorazepam, to “soften the patient up a little.” The drugs were given until the patient was sleepy enough to allow the introduction of a laryngoscope into the mouth. The problem resulted when the epiglottis or larynx was stimulated, causing rapid central nervous system (CNS) arousal and vomiting. This method is distinctly different from the delivery of rapid-push induction agents used in RSI.

Meanwhile, in the OR, anesthesiologists would take a carefully prepared patient, keep him or her from eating or drinking anything (NPO) for hours, evaluate the airway for a potentially difficult intubation, then deliver a cocktail of carefully measured drugs, which rapidly would induce unconsciousness and muscle relaxation. The completely defenseless patient could be intubated without resistance. If a difficulty arose, backup readily was available, and ultimately, the anesthesiologist had the option of canceling the case and trying another approach to intubation on another day.

In the ED, canceling the case is rarely, if ever, an option. Further, every ED/trauma patient seemingly just finished a dinner consisting of beer and a pizza with everything. He or she then often has the nerve to violate the law of inertia and go par-

tially through the windshield just before becoming entrapped in a car that flipped upside down in three feet of water. So much for NPO, a controlled environment, and an ASA class I (healthy) patient!

This type of setting demands a better approach to the patient in need of emergent definitive airway management.

When the technique of RSI was assimilated into emergency medicine practice from the OR, the word “induction” was replaced with “intubation,” thereby focusing the procedure on the establishment of an airway rather than the induction of anesthesia for an operative case. The American College of Emergency Physicians endorses RSI as the standard of practice for airway management.<sup>8</sup> Nasotracheal intubation (NTI), which once was the primary method of intubation in the ED, largely has been replaced by RSI. A national survey of emergency medicine residencies showed an average of only 2.8 NTIs during a three-year period by emergency medicine residents.<sup>9</sup> RSI is considered routine in most EDs; it is utilized in up to 84% of all ED intubations, with success rates reported at 97%.<sup>8,10-14</sup>

The role of RSI in trauma has been evolving and it currently is considered the method of choice for emergent airway control in the traumatized patient unless specific contraindications are present.<sup>1,4,15</sup>

### RSI Technique

RSI is a method of quickly obtaining optimal intubating conditions via the delivery of an induction agent (to induce unconsciousness) followed in rapid succession by a paralytic agent. The goal of RSI is to facilitate the passage of an ET tube into the trachea quickly and efficiently. RSI eliminates or reduces the need for ventilating the patient during the procedure unless oxygenation is impaired and the bag-valve mask must be used to maintain adequate saturation. This technique should minimize the chances of aspiration of stomach contents during the intubation.

Various methods of teaching RSI for the emergency clinician have been developed, but the use of the “Seven P’s of RSI,” as described by Walls and Murphy,<sup>1</sup> is the one that is the best developed. The algorithm described below is a modification of the above approach specifically adapted to the ED and includes eight P’s—plan B, prepare, preoxygenate, pretreat, put down, paralyze, pass the tube, prove placement.

**Plan B.** The first P in this series refers to the predetermined plan for dealing with a difficult or failed orotracheal intubation. It can be very disconcerting (at the very least) to discover a heretofore unknown airway anomaly in what appears to be an easy intubation. A recent article published in the anaesthesia literature found an *unanticipated* failed intubation occurred in 0.4% of the cases (44 of 11,621 patients).<sup>16</sup> Published reports of the ED airway management experience at several teaching hospitals found that rate of difficult intubation was less than 5%.<sup>11,12</sup> A complicated situation rapidly can become a disaster if no pre-implemented plan exists to deal with an anomaly. To avoid potential disasters, it is recommended that all EDs have assembled an emergency airway cart for use in trauma patients.

## Table 4. Contents of Ohio State University Airway Cart

### A COMPLETE SET OF RSI DRUGS

- Induction/sedation agents: Etomidate, ketamine, midazolam, and fentanyl
- Paralytic agents: Succinylcholine, rocuronium, vecuronium
- Adjunctive medications: Atropine, lidocaine

### ENDOTRACHEAL TUBES, VARIOUS SIZES AND TYPES (PEDIATRIC AND ADULT)

- Endotrol tubes
- Oropharyngeal and nasopharyngeal airways

### ADDITIONAL LARYNGOSCOPE PARTS

- Miller and Macintosh blades
- Standard laryngoscope handle
- Short laryngoscope handle
- Pediatric laryngoscope handle
- Spare bulbs

### AIRWAY ADJUNCTS

- Gum elastic bougie
- Laryngeal mask airways (LMAs) and intubating laryngeal mask airways (ILMAs)
- Combitubes
- A lighted wand stylet with multiple sizes of stylets
- Retrograde intubation sets

### SURGICAL AIRWAY TOOLS

- Percutaneous and open cricothyrotomy kits
- Scalpels (#10, #11, #15 blades)
- Extra instruments

### NEEDLES AND SYRINGES OF VARIOUS SIZES

It is present at all intubations. For a list of the items in the ultimate, complete, difficult airway cart, see Appendix 1 in *The Manual of Emergency Airway Management*.<sup>17,18</sup> The minimum required equipment utilized by the author as part of a difficult airway cart is listed in Table 4.

**Prepare.** Taking the time to organize and inventory the working environment directly prior to the actual intubation assures that everything needed to perform the task will be available and in good working order. Not only does this preparation provide peace of mind and decrease stress levels, it can be a time- and life-saving investment.

Preparation includes the following:

- Thoroughly evaluate the patient for a potentially difficult intubation and for difficulty with bag-valve mask ventilation;
- Remove the patient’s dentures;
- Bring the difficult airway cart to the bedside;
- Have the chosen laryngoscope blades ready (two sizes of Macintosh blades, two Miller blades);
- Check the light on the laryngoscope blades;
- Verify the integrity of the balloon on the ET tube; and
- Have suction ready at the bedside. When preparing suc-

tion, it is useful to have two suction options available. A standard Yankaur tip works well for loose secretions but does not adequately aspirate such common items as steak, pizza, mushrooms, and other assorted food morsels often found in the posterior pharynx of ED patients. It may be useful to cut the tip off of the Yankaur suction with some trauma shears prior to intubating the patient.

- Verify the integrity of your IV access and start a second IV line. A disastrous situation can result when an induction agent is given, and the IV stops working before the paralytic agent can be pushed. Have your chosen means to secure the ET tube ready to implement.

- Have color-change capnography device at bedside.

**Preoxygenate.** As early as possible in the course of preparation for intubation, the patient should be placed on 100% FiO<sub>2</sub>. Standard non-rebreather masks only deliver FiO<sub>2</sub> at approximately 70%, because they allow the entraining of room air. The goal is to “denitrogenate” the patient’s functional residual capacity and replace it with oxygen. This step can afford the intubator some buffer time during the procedure. The healthy 70 kg adult can take as long as eight minutes to desaturate to 90%, whereas further desaturation from 90% to 0% can take only two minutes. This reflects the characteristic “slippery slope” found in the oxyhemoglobin saturation curve. Heavier patients and small children typically will desaturate faster.<sup>19</sup> The typical ED trauma patient requiring intubation may not have a normal cardiopulmonary function and, therefore, may fail to optimally oxygenate. Further, some pulmonary processes that impair oxygenation also will antagonize the effects of prolonged preoxygenation.

In an ideal setting, a patient should breathe 100% oxygen for five minutes prior to attempts at intubation. Most ED oxygen delivery devices (even non-rebreather masks) achieve only a 75% FiO<sub>2</sub>; the use of a Capnoflo brand bag-valve mask delivers close to 100%. Patients who are stable enough should receive adequate preoxygenation. However, in the ED, some patients with impending apnea will not tolerate a five-minute period of preoxygenation. Instead, eight vital capacity breaths of 100% oxygen may serve the same nitrogen washout function and effectively retard apnea-induced hemoglobin desaturation.<sup>20</sup>

When studied, most ED oxygen delivery devices cannot deliver adequate oxygen flow to reach an FiO<sub>2</sub> even close to 100%. Non-rebreather masks only achieve a 75% FiO<sub>2</sub> because they allow the entraining of room air.

When put to the test, some commonly used resuscitation bag-valve mask systems achieved FiO<sub>2</sub>s that never exceeded 40% (Code Blue™ and 1st Response™). By using a one-way exhalation valve that does not allow for the entrainment of room air, only the Capno-Flow™ and the Silicone Resuscitator™ brand bag-valve mask systems were able to deliver greater than 90% oxygen.<sup>21</sup>

**Pretreat.** The pretreatment phase of RSI involves the delivery of medications to modify the physiologic response during and after intubation. One mnemonic used to describe the types of medications frequently used in the pretreatment phase is “LOAD,”

## Table 5. LOAD Mnemonic for Pretreatment Phase of RSI

### L — LIDOCAINE (1.5 MG/KG IV OR NEBULIZED [SEE BELOW])

- The use of lidocaine in RSI has been advocated to blunt the intracranial pressure rise associated with RSI. The evidence supporting its effectiveness is not clear, and conflicting reports of the degree of effect exist.<sup>22,23</sup> A recent study implied that hemodynamic responses to laryngeal stimulation could be effectively blunted with the use of topical 4% lidocaine (sprayed directly on the larynx) and partially blunted with intravenous lidocaine.<sup>24</sup>
- Lidocaine also can be delivered topically to the posterior pharynx and upper airway by nebulization. Four cc of 4% lidocaine can be nebulized in a standard aerosol set with a facemask. This delivers 160 mg of lidocaine. Caution should be used so as not to exceed 5 mg/kg of lidocaine.

### O — OPIATES (FENTANYL [SUBLIMAZE] 2-9 MCG/KG IV)

- Opiates can be used to attenuate the sympathetic responses to intubation. This can be important when treating a patient who might not tolerate hypertension or tachycardia associated with laryngeal stimulation. A recent study demonstrated that pretreatment with fentanyl (2 mcg/kg), immediately prior to the induction of anesthesia, significantly reduced the hemodynamic response to endotracheal intubation.<sup>25</sup>

### A — ANTICHOLINERGIC AGENTS (CHOOSE ONE)

- Atropine: Children—0.01-0.02 mg/kg IV (min 0.1 mg); adults—0.5-1.0 mg IV *or*
- Glycopyrrolate (Robinul): Children—0.004 mg/kg IV; adults— 0.2-0.4 mg IV
  - Use in children to prevent potentially lethal bradycardia/asystole (seen with succinylcholine)
  - Use in adults and children as an antisialogogue when ketamine is used.

### D — DEFASCICULATING AGENTS (CHOOSE ONE)

- Succinylcholine 0.15 mg/kg IV *or*
- Vecuronium 0.01mg/kg IV *or*
- Rocuronium 0.1 mg/kg IV
  - Defasciculation refers to decreasing/eliminating the muscle fasciculations (twitches) that occur in response to the initial depolarizing effect of succinylcholine. These muscle contractions can produce a rise in intracranial and intraocular pressure.
  - Use defasciculating doses of paralytic agents in patients with head injury or open-globe eye injuries.
  - Can use 1/10th the intubating dose of any available paralytic agent
  - Administer drug three minutes prior to intubation.

Detailed drug information and dosages derived from 2002 *Physician's Desk Reference* and the 2002 American Hospital Formulary Service Drug Information—American Society of Health-System Pharmacists.

**Table 6a. Induction Agents for Use in RSI**

**ETOMIDATE (AMIATE)**

**Dosage:** 0.3 mg/kg IV  
**Pregnancy Category:** C  
**Preparation:** 2 mg/mL  
**Description:** Non-barbiturate, sedative hypnotic with anesthetic and amnestic properties (no analgesia)  
**Onset:** < 60 seconds  
**Duration:** 5-10 minutes  
**Reversal Agents:** None  
**Indications:** Need for rapid induction; excellent for older patients or those with tenuous cardiovascular status; hypotension  
**Contraindications:** Allergy to etomidate; in Addison's Disease, must supplement corticosteroids  
**Major Side Effects:** Apnea related to dose and rate of administration is rare and only minor respiratory depression is seen; pain on injection common; decreased ICP and cerebral perfusion pressure; spontaneous myoclonus (not seizure) is seen in up to 30% of patients; transient ACTH-resistant/hydrocortisone-responsive decrease in the production of cortisol; vomiting and hiccoughs are possible during and post-procedure

**KETAMINE (KETALAR)**

**Dosage:** 1-2mg/kg IV push  
**Pregnancy Category:** Unknown  
**Preparations:** 100, 50 & 10 mg/mL  
**Description:** Dissociative anesthetic; PCP derivative. May act at multiple receptor sites including opioid and cholinergic; only single agent with anesthetic, amnestic, and analgesic properties.  
**Onset:** IV: 30-60 seconds  
**Duration:** IV: 10-15 minutes  
**Reversal Agents:** None proven; naloxone & physostigmine may have some theoretical effect  
**Indications:** The need for induction in a hypotensive patient; need for induction in a patient with bronchospasm  
**Contraindications:** Elevated ICP; ischemic heart disease; age < 3 months  
**Major Side Effects:** (Side effects rarely outweigh the potential benefits of ketamine as an induction agent in the hypotensive patient.) Transient 20-30% increase in BP; increase in heart rate; increase in ICP has been reported; nystagmus; nausea—vomiting is rare and usually occurs late after emergence; excess salivation can be controlled with atropine/glycopyrrolate; hallucinations on awakening (rare in children < 13 years of age). Hallucinations are much less frequent than previously reported in adults and virtually are eliminated by the addition of 2 mg of midazolam; transient apnea is very rare and seen only with rapid-push of high doses.

**THIOPENTAL (PENTOTHAL)**

**Dosage:** Adult— 3-5 mg/kg IV rapid push. Children—2-6 mg/kg IV rapid push. Decrease dose with hypotensive/elderly (1-2 mg/kg).  
**Pregnancy Category:** C  
**Preparation:** Multiple  
**Description:** Barbiturate anesthetic agent with a rapid onset of action.  
**Onset:** 30-60 seconds  
**Duration:** 10-20 minutes  
**Reversal Agents:** None proven  
**Indications:** Induction of anesthesia in RSI; possibly useful in patients with head injury to lower ICP  
**Contraindications:** Porphyria; status asthmaticus; significant cardiovascular problem producing hypotension; hypotension  
**Major Side Effects:** Decreases BP—hypotension is common; barbiturates may potentiate/increase pain (antianalgesia); exacerbation of bronchospasm can occur in status asthmaticus; nausea/vomiting

**PROPOFOL (DIPRIVAN)**

**Dosage:** Adult and children: 2-2.5 mg/kg IV slowly over 30 sec in 2-3 divided  
**Pregnancy Category:** B  
**Preparation:** 10 mg/mL  
**Description:** Non-barbiturate, sedative-hypnotic with anesthetic and amnestic properties.  
**Onset:** < 60 seconds  
**Duration:** 5-10 minutes  
**Reversal Agents:** None  
**Indications:** Induction of anesthesia in hemodynamically stable patients  
**Contraindications:** Allergy to albumin or egg whites; hypotension; compromised cardiac function ; caution in elderly patients (exaggerated hypotension)  
**Major Side-Effects:** Transient hypotension and apnea are related to dose and rate of administration; pain on injection (10%); decreased ICP and cerebral perfusion pressure

Detailed drug information and dosages derived from 2002 Physician's Desk Reference and the 2002 American Hospital Formulary Service Drug Information, American Society of Health-System Pharmacists.

described by Walls, et al, in the *Manual of Emergency Airway Management*.<sup>26</sup> (See Table 5.)

**Put Down.** The next step involves the induction of anesthesia with a rapid-acting induction agent. This step is performed virtually simultaneously with the next step, administration of a paralytic agent. Owing to the rapid onset of agents such as etomidate and ketamine, complete loss of consciousness can be achieved in 30-45 seconds. The onset of succinylcholine, the paralytic agent of choice, usually is less than 1 minute. When

given in rapid succession, the onset of induction and paralysis can be almost simultaneous.

- Induction agents are given simultaneously to, or in rapid succession with, paralytic agents;
- Apply cricoid pressure (Sellick's maneuver). Do not release until placement is verified; and
- Do not ventilate until patient is intubated or reoxygenation is required.

*Induction Agents — Etomidate (Amidate).* If only one drug

**Table 6b. Paralytic Agents for Use in RSI****SUCCINYLCOLINE (ANECTINE/QUELICIN)****Dosage:** Adult: 1.5 mg/kg IV rapid push**Pregnancy Category:** C**Preparation:** 20 mg/mL**Description:** Depolarizing neuromuscular blocking agent**Onset:** IV: 30-60 seconds**Duration:** IV: 6-12 minutes**Reversal Agents:** None**Indications:** First-line paralytic agent in RSI**Contraindications:** Burn or spinal cord injury patients > 48 h post injury; open-globe ocular injury; use can cause bradycardia unless pretreatment with anticholinergic; known hyperkalemia**Major Side-Effects:** Muscular fasciculations; transient hyperkalemia; increased ICP and intraocular pressure**ROCURONIUM (ZEMURON)****Dosage:** Adults and children: 0.6-1.2 mg/kg IV rapid push**Pregnancy Category:** B**Preparations:** 10 mg/mL**Description:** Non-depolarizing neuromuscular blocking agent**Onset:** 45-90 sec**Duration:** 15-40 min.**Reversal Agents:** Neostigmine**Indications:** Good second-line agent for RSI; rapid onset but long duration of action**Contraindications:** Hypersensitivity to rocuronium; hypersensitivity to bromides;**Major Side-Effects:** Tachycardia; transient hypo/hypertension

Detailed drug information and dosages derived from 2002 *Physician's Desk Reference* and the 2002 American Hospital Formulary Service Drug Information, American Society of Health-System Pharmacists.

is available to utilize for RSI in ED patients, etomidate is the agent of choice. With its onset of action in one arm-to-brain circulation (30 seconds), a duration of action of only 3-10 minutes, and very little effect on cardiovascular hemodynamics, etomidate is ideally suited for sick, potentially hypotensive or grossly unstable patients. It has gained significant popularity for use in ED RSI.<sup>27</sup> (See Table 6a.)

Etomidate is a non-barbiturate sedative-hypnotic agent unrelated to other induction agents. This medication typically is delivered by a single dose of 0.3 mg/kg given by rapid IV push, often simultaneous with, or directly preceding, a paralytic agent. The reported incidence of etomidate-induced myoclonus (up to 30%) is of little significance since all movement will be obliterated with the coadministration of a rapid-acting paralytic drug. Benzodiazepines and opiates have been employed to attenuate etomidate-induced myoclonus. Studies in adults have found that the only consistent effects are achieved with fentanyl at doses of 500 mcg.<sup>28</sup> Transient adrenocortical dysfunction lasting 12 hours after a single bolus dose of 0.3 mg/kg of etomidate has been reported. This effect appears to have little clinical relevance since serum cortisol levels remain within normal

parameters during the period of dysfunction.<sup>29</sup>

If etomidate is given without a paralytic agent, most patients will continue to breathe. Although sufficient intubating conditions often are produced with etomidate alone, myoclonus (especially involving the jaw) can interfere with the process, requiring rescue paralysis.

*Ketamine (Ketalar).* Ketamine, a dissociative anesthetic derived from PCP, is unique in that it is the only agent which provides analgesic, amnestic, and anesthetic (sedative-hypnotic) properties.

Despite an inherent myocardial depressant effect, ketamine stimulates the release of endogenous epinephrine, causing an increase in heart rate, blood pressure, myocardial oxygen consumption, and bronchodilation.

This agent is best suited for hypotensive patients, owing to the cardiovascular support provided by this drug. Current recommendations caution against the use of ketamine in patients with head injury. Although an increase in intracranial pressure is reported, this appears to result from an increase in cerebral blood flow. Increases in brain perfusion potentially can offset the increased ICP, calling into question the clinical relevance of this untoward effect.

The frequency of emergence hallucinations, reported with the use of ketamine in adults may be overstated. The addition of a benzodiazepine may control or minimize any effects that may occur. Further, in the ED patient who will remain ventilated, sedated, and paralyzed, emergence reactions have little significance.

*Thiopental (Pentothal).* Pentothal is a classic induction agent with very rapid onset and short duration of action. It can lower intracranial pressure. Since it can drop blood pressure significantly with one dose, it is not a good agent for unstable or hypotensive patients. This agent has amnestic and anesthetic properties with paradoxical antianalgesic effects sometimes observed.

*Propofol (Diprivan).* Propofol can produce potentially severe hypotension in cardiovascularly compromised or blood volume depleted patients. Availability of other choices makes propofol suboptimal for ED RSI in all but the most cardiovascularly stable patients.

**Paralyze.** This step involves the delivery of a rapid-acting paralytic agent given simultaneously, or in close succession with, an induction agent.

Paralytic agents induce profound muscle relaxation by inhibiting the action of acetylcholine (Ach) at the neuromuscular endplate. These drugs are either depolarizing or non-depolarizing, depending on their interaction with the Ach receptor. (See Table 6b.)

Depolarizing agents such as succinylcholine fit into the Ach receptor and act to initially cause depolarization of the motor endplate and induce contraction, manifesting clinically as fasciculations. Subsequently, the receptor is blocked by the succinylcholine, preventing Ach from binding and producing further contraction. The paralysis lasts until succinylcholine is degraded by acetylcholinesterase.

Non-depolarizing agents such as vecuronium and rocuroni-

um competitively inhibit the Ach receptor, occupying it and then exiting the site. These agents are removed from the neuromuscular junction and broken down in the liver. Their duration and onset of action generally are longer than succinylcholine.

*Succinylcholine (Anectine/Quelicin).* Succinylcholine is the first line agent for paralysis in RSI. No agent consistently has demonstrated comparable rapidity of onset and short duration of action. In otherwise normal individuals, the use of succinylcholine results in only minimal changes in serum potassium of 0.5-1 mEq/L.<sup>19,30</sup> The magnitude of this effect is enhanced in two groups of patients. The first group is those who have had massive tissue destruction such as severe burns, massive trauma, and rhabdomyolysis. Owing to the large surface area of damaged muscle that is capable of leaking potassium, severe, rapidly fatal hyperkalemia can develop. Mortality rates can reach 30%, even with treatment.<sup>31</sup>

The second group is comprised of patients who develop an up-regulation of acetylcholine receptors. When muscles lose their normal input from motor nerves, the acetylcholine receptors normally located in the motor endplates increase in density and spread over the surface of the muscle. Stimulation from succinylcholine causes an exaggerated release of potassium. Conditions which cause this effect include: CNS injury (CVA); spinal cord injury; neuromuscular diseases with muscle wasting (e.g., muscular dystrophy, etc.); disuse atrophy; and any other cause of chronic denervation. This problem is not seen if the injury is acute, but rather develops after 24-48 hours.

Recent literature suggests that the risk of adverse events when succinylcholine is used on known hyperkalemic patients ( $K > 5.5\text{mEq/L}$ ) is lower than generally believed, with a maximum catastrophic event risk of 7.9%.<sup>30</sup> Although this clearly is not a trivial risk, succinylcholine may still be the drug of choice when neuromuscular paralysis is required and suitable alternatives are not available.

Succinylcholine can be stored unrefrigerated for up to three months with only minimal degradation (10% loss) of its paralytic properties.<sup>18</sup>

*Rapacuronium (Rapalon).* Rapacuronium is designed as a competitor to succinylcholine in RSI. To date, this agent has the shortest onset of action and duration of any non-depolarizing paralytic. Unfortunately, rapacuronium recently was removed from the market due to a few cases of fatal bronchospasm attributed to its use.

*Rocuronium (Zemuron).* Rocuronium is slightly slower than succinylcholine in onset of paralysis, but it is faster than most other non-depolarizing agents. A recent meta-analysis reported that although rocuronium was inferior to succinylcholine in providing excellent intubating conditions, it was comparable to succinylcholine in inducing clinically acceptable intubating conditions.<sup>32</sup> A recent report looked at rocuronium and found it to be an effective agent for RSI when succinylcholine was contraindicated.<sup>33</sup>

**Pass the Tube.** The goal of RSI is to get to this very point with the least possible difficulty. Here, the ET tube is passed through the cords via direct visualization. Prior to and during this process, cricoid pressure is maintained until the ET tube

cuff is inflated where appropriate. A complete discussion of basic intubating techniques is beyond the scope of this text, so only a few tips will be presented. Many other techniques, tools, and tricks will be covered in the second part of this article.

One technique that has been described to facilitate direct visualization of a slightly anterior larynx is called "BURP" for "Backwards-Upwards-Rightwards-Pressure."<sup>34,35</sup> The assistant applies pressure to the thyroid cartilage, first backward, then upward, and finally rightward. The adult larynx should be displaced about 2 cm to the right. Meanwhile, the intubator should attempt direct visualization of the larynx. Alternatively, the intubator can place his or her hands over the assistant's hand and direct the pressure while attempting to visualize the glottis. When the cords are seen, pressure can be released by the intubator, and the assistant can continue to hold the optimal position.

A recent article described the use of a simple and effective technique called External Laryngeal Manipulation (ELM). ELM achieves the same backward, upward and rightward airway repositioning as does "BURP," however the pressure is applied by the intubator with his or her right hand.<sup>36,37</sup> One of the most common pitfalls is failure to adequately sweep the tongue out of the way. By inserting the blade as far to the right as possible, the intubator more effectively can force the tongue to the left.

The laryngoscope blade can be placed as deep as possible into the oropharynx, allowing it to enter the esophagus. When the blade slowly is withdrawn, the first anatomical structure to be encountered is the larynx, followed by the epiglottis.

**Prove Placement.** The final step is to verify the correct placement of the ET tube into the trachea. Inadvertent placement of the ET tube into the esophagus is OK. Failure to immediately recognize and remedy this error is not.

After the tube is passed and the cuff is inflated (where appropriate), the chest should be auscultated to listen for breath sounds. The stethoscope need only be placed in three locations to properly auscultate: the left axilla, the right axilla, and over the epigastrium. Absent breath sounds and/or sounds of gastric insufflation means that the wrong tube has been accessed. Unequal breath sounds can imply that the tube is in the right (or sometimes the left) mainstem bronchus.

In all ORs, the standard of care is to use the detection of a CO<sub>2</sub> waveform with formal capnography as confirmation of tracheal placement of an ET tube. The standard should be no less in the ED. Although quantitative capnography devices are beginning to appear in EDs, they are not yet commonplace. The use of inexpensive color-change CO<sub>2</sub> detectors represents a practical alternative. The detection of CO<sub>2</sub>, indicated by a purple to yellow color change, is 100% specific for tracheal placement of the ET tube, whereas the failure to detect color change strongly suggests esophageal intubation.<sup>38</sup> In cardiac arrest, the lack of lung perfusion can lead to the absence of CO<sub>2</sub> and a lack of color change despite the correct placement of the ET tube in the trachea.

The esophageal intubation detector (EID) is a simple device that relies on negative pressure to detect misplacement of an ET

tube. This device is a small bulb that is squeezed to evacuate the air and then placed on the end of the ET tube. When the bulb is released, it tries to reexpand. If the ET tube is in the esophagus, the esophageal walls, which are not rigid, will collapse around the end of the ET tube and prevent air from being sucked up the tube and thereby prevent bulb reinflation. In the rigid trachea, however, air can be sucked into the ET tube and the bulb will reinflate in fewer than two seconds. In clinical application, this device generally has been effective in detecting most esophageal intubations when direct visualization was not possible or capnography was not available.<sup>39-41</sup> A recent report, however, documented cases in which the detector gave false positive results for tracheal intubation.<sup>42</sup>

A chest radiograph should be performed as soon as possible to confirm ET tube placement and document position.

### Issues in the Pediatric Airway

A detailed discussion of all of the factors affecting the pediatric trauma airway is beyond the scope of this paper. Highlights of the anatomic and physiologic differences between the adult and pediatric patient as they pertain to airway management will be presented.<sup>43,44</sup>

#### Anatomic Differences

- Large tongue in children;
- Anterior position of tracheal opening: younger than 2 years of age—high anterior tracheal opening; 2-8 years—transition; older than 8 years—airway is like small adult;
- Large occiput causing neck flexion;
- Large tonsils and adenoids;
- Small cricothyroid membrane—cricothyroidotomy contraindicated;
- Acute angle between epiglottis and laryngeal opening—difficult nasal intubation;
- Narrowest part of the airway is below the vocal cords at the cricoid ring.

#### Physiologic Differences

- Shorter time to oxygen desaturation. As a result of increased basal metabolism and smaller functional residual capacity, pediatric patients can desaturate in 50% of the time that an adult patient does.
- Need for higher doses (2 mg/kg) of succinylcholine
- High tendency for vagal effects of succinylcholine—must use atropine to prevent bradycardia in patients younger than 10 years of age.

**Implications for Airway Management.** The above anatomic and physiologic differences have the following implications that warrant adjustment in standard intubating technique:

- Pay attention to adequate preoxygenation and expect rapid desaturation;
- Visualization of the anterior airway may be facilitated with a straight pediatric blade—if the airway is not easily visualized, try withdrawing a deeply placed blade slightly and watch the epiglottis fall into view;
- Do not hyperextend the neck. In a nontrauma patient, a

towel roll can be placed behind the shoulders to raise the torso to match the position of the head;

- In-line spine immobilization during orotracheal intubation is recommended;
- Use uncuffed ET tubes until size 6.0 is required. Estimate ET tube size as (age in years + 16)/4;
- Pretreat patients with atropine (0.01 mg/kg with 0.1 mg minimum);
- Use 2 mg/kg succinylcholine;
- Do not perform surgical cricothyroidotomy in patients younger than 10 years of age;
- Use caution and expect difficulty with nasotracheal intubation;
- Do not push the ET tube too deep and intubate the right mainstem bronchus;
- Use Broselow tape to do dosages, diameters, and depths.

### Implications for the Hypotensive Patient

In the injured patient who is hypotensive and requires definitive airway management, some modifications to the standard RSI protocol should be given consideration. Although almost all induction agents can produce hypotension and myocardial depression, the two agents etomidate and ketamine have the best hemodynamic profiles.<sup>27,45</sup> Etomidate has little effect on cardiac contractility and respiratory rate, making it an excellent choice for induction in the trauma patient. Although etomidate is very cardiostable, in hypotensive or volume depleted patients, doses should be reduced to one half the usual induction dose (from 0.3 mg/kg to 0.15 mg/kg).<sup>46</sup>

Ketamine releases endogenous catecholamines. In patients who are not catecholamine-depleted by prolonged maximal physiological stress, ketamine will accelerate heart rate and raise blood pressure. In patients with significant head injury, ketamine remains relatively contraindicated due to its possible adverse effects on intracranial pressure.<sup>45,46</sup>

Barbiturates (thiopental and methohexital), propofol, and large doses of midazolam should not be used in hypotensive patients due to their propensity to significantly lower blood pressure.

Fortunately, the most commonly employed paralytic agent, succinylcholine, does not produce hypotension. Bradycardia, which most often is seen in children who receive succinylcholine, can be abolished with small doses of atropine (0.02mg/kg). If succinylcholine must be redosed in adults, atropine (1-2 mg IV) should be given prior to the second dose to prevent enhanced vagal tone.

### References

1. Walls RM. Rapid sequence intubation in head trauma. *Ann Emerg Med* 1993;22:1008-1013.
2. Wilson ME. Predicting difficult intubation. *Br J Anaesthesia* 1988; 61:311.
3. American Society of Anesthesiology. Practice guidelines for management of the difficult airway—A report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway.

- Anesthesiology* 1993;78:597-602.
4. Walls RM. Management of the difficult airway in the trauma patient. Contemporary Issues in Trauma. *Emerg Med Clin North Am* 1998; 16:1, 45-61.
  5. Langeron O, Masso E, Huraux C, et al. Prediction of difficult mask ventilation. *Anesthesiology* 2000;92:1229-1236.
  6. Kaide C. Invasive and non-invasive ventilation. In: Hoskstra JW, ed. *Handbook of Cardiovascular Emergencies*. 2nd ed. Philadelphia; Lippincott Williams & Wilkins:2001.
  7. Danzel DF, Pozos RS, Hamlet MP. Accidental hypothermia. In: Auerbach PS, ed. *Wilderness Medicine*. 3rd ed. St. Louis; Mosby:1995.
  8. American College of Emergency Physicians. Rapid-sequence intubation [practice guidelines]. *Ann Emerg Med* 1997;29:573.
  9. Roppolo LP, Vilke GM, Chan TC, et al. Nasotracheal intubation in the emergency department, revisited. *J Emerg Med* 1999;17:791-799.
  10. Li J, Murphy-Lavoie H, Bugas C, et al. Complications of emergency intubation with and without paralysis. *Am J Emerg Med* 1999;17: 141-143.
  11. Tayal VS, Riggs RW, Marx JA, et al. Rapid-sequence intubation at an emergency medicine residency: Success rate and adverse events during a two-year period. *Acad Emerg Med* 1999;6:31-37.
  12. Sakles JC, Laurin EG, Rantapaa AA, et al. Airway management in the emergency department: A one-year study of 610 tracheal intubations. *Ann Emerg Med* 1998;31:325-332.
  13. Walls RM. Rapid-sequence intubation comes of age. *Ann Emerg Med* 1996;28:79-81.
  14. Gerardi MJ, Sacchetti AD, Cantor RM. Rapid-sequence intubation of the pediatric patient—Pediatric Emergency Medicine Committee of the American College of Emergency Physicians. *Ann Emerg Med* 1996;28:55-74.
  15. Tobias JD. Airway management for pediatric emergencies. *Pediatric Annals* 1996;25:317-328.
  16. Dimitriou V. Flexible lightwand-guided tracheal intubation with the intubating laryngeal mask Fastrach™ in adults after unpredicted failed laryngoscope-guided tracheal intubation. *Anesthesiology* 2002; 96: 296-299.
  17. Appendix 1. In: Walls RM, Luten RC, Murphy MF, et al, eds. *Manual of Emergency Airway Management*. 1st ed. Philadelphia; Lippincott Williams & Wilkins: 2000.
  18. Schneider RE. Sedatives and induction agents. In: Walls RM, Luten RC, Murphy MF, et al, eds. *Manual of Emergency Airway Management*. 1st ed. Philadelphia; Lippincott Williams & Wilkins: 2000.
  19. Zink BJ, Snyder HS, Raccio-Robak N. Lack of a hyperkalemic response in emergency department patients receiving succinylcholine. *Acad Emerg Med* 1995;11:974-978.
  20. Baraka AS, Taha SK, Aouad MT, et al. Preoxygenation: Comparison of maximal breathing and tidal volume breathing techniques. *Anesthesiology* 1999;91:3, 612-616.
  21. Nimmagadda U. Efficacy of pre-oxygenation with tidal volume breathing. *Anesthesiology* 2000;93:693-698.
  22. Lev R, Rosen P. Prophylactic lidocaine use preintubation: A review. *J Emerg Med* 1994;12:4, 499-506.
  23. Samaha T, Ravussin P, Claquin C, et al. Prevention of increase of blood pressure during endotracheal intubation in neurosurgery: Esmolol versus lidocaine. *Ann Fr Anesth Reanim* 1996;15:36-40.
  24. Lanoix R, Gupta R, Leak L, et al. C-spine injury associated with gunshot wounds to the head: Retrospective study and literature review. *J Trauma* 2000;49:860-863.
  25. Adachi Y, Satomoto M, Higuchi H, et al. Fentanyl attenuates the hemodynamic response to endotracheal intubation more than the response to laryngoscopy. *Anesth Analg* 2002;95:233-237.
  26. Walls RM. The emergency airway algorithms. In: Walls RM, Luten RC, Murphy MF, et al, eds. *Manual of Emergency Airway Management*. 1st ed. Philadelphia; Lippincott Williams & Wilkins:2000.
  27. Smith DC, Bergen JM, Smithline H, et al. A trial of etomidate for rapid sequence intubation in the emergency department. *J Emerg Med* 2000;18:13-16.
  28. Stockham RJ, Stanley TH, Pace NL, et al. Fentanyl pretreatment modifies anaesthetic induction with etomidate. *Anaesthesia Intensive Care* 1988;16:171-176.
  29. Schenarts CL, Burton JH, Riker RR. Adrenocortical dysfunction following etomidate induction in emergency department patients. *Acad Emerg Med* 2001;8:1-7.
  30. Schow AJ, Lubarsky DA, Olson RP, et al. Can succinylcholine be used safely in hyperkalemic patients? *Anesth Analg* 2002;95:119-122.
  31. Gronert GA. Cardiac arrest after succinylcholine: Mortality greater with rhabdomyolysis than receptor upregulation. *Anesthesiology* 2001;94:523-529.
  32. Perry JJ. Are intubating conditions using rocuronium equivalent to those using succinylcholine? *Acad Emerg Med* 2002;9:813-823.
  33. Sakles JC, Laurin EG, Rantapaa AA, et al. Rocuronium for rapid sequence intubation of emergency department patients. *J Emerg Med* 1999;17:611-616.
  34. Knill RL. Difficult laryngoscopy made easy with a “BURP.” *Can J Anaesth* 1993;40:279-282.
  35. Takahata O, Kubota M, Mamiya K, et al. The efficacy of the “BURP” maneuver during a difficult laryngoscopy. *Anesth Analg* 1997;84:419.
  36. Knopp RK. External laryngeal manipulation: A simple intervention for difficult intubations. *Ann Emerg Med* 2002;40:38-40.
  37. Levitan RM, Mickler T, Hollander JE. Bimanual laryngoscopy: A videographic study of external laryngeal manipulation by novice intubators. *Ann Emerg Med* 2002;40:30-37.
  38. Walls RM. Confirmation of endotracheal tube placement. In: Walls RM, Luten RC, Murphy MF, et al, eds. *Manual of Emergency Airway Management* 1st ed. Philadelphia; Lippincott Williams & Wilkins: 2000.
  39. Bozeman WP, Hexter D, Liang HK, et al. Esophageal detector device

## CE/CME Objectives

Upon completing this program, the participants will be able to:

- a.) Recognize indications for invasive airway intervention;
- b.) Recognize a potentially difficult airway;
- c.) Relate the technique of obtaining optimal intubation conditions via the delivery of induction and paralytic agents; and
- d.) Identify both likely and rare complications that may occur during the process of intubation.

- versus detection of end-tidal carbon dioxide level in emergency intubation. *Ann Emerg Med* 1996;27:95.
40. Kasper CL, Deem S. The self-inflating bulb to detect esophageal intubation during emergency airway management. *Anesthesiology* 1998; 88:898-902.
  41. Zaleski L, Abello D, Gold M. The esophageal detector device: Does it work? *Anesthesiology* 1993;79:244-247.
  42. Ardagh M, Moodie K. The esophageal detector device can give false positives for tracheal intubation. *J Emerg Med* 1998;16:747-749.
  43. Luten RC. The pediatric patient. In: Walls RM, Luten RC, Murphy MF, et al, eds. *Manual of Emergency Airway Management*. 1st ed. Philadelphia; Lippincott Williams & Wilkins:2000.
  44. Yamamoto LG. Emergency airway management—Rapid sequence intubation. In: Fleisher GR, Ludwig S, eds. *Textbook of Pediatric Emergency Medicine*. 4th ed. Philadelphia; Lippincott Williams & Wilkins:2000.
  45. Springhouse Physician's Drug Handbook, 8th ed. Springhouse, PA; Springhouse Publishing Co.:1999.
  46. Schneider RE. Muscle relaxants. In: Walls RM, Luten RC, Murphy MF, et al, eds. *Manual of Emergency Airway Management*. 1st ed. Philadelphia; Lippincott Williams & Wilkins:2000.

## CE/CME Questions

*Effective with this issue, Trauma Reports is changing its testing procedure. You will no longer need to return a Scantron answer sheet to earn credit for the activity. Please review the text, answer the following questions, check your answers against the key on the following page, and then review the materials again regarding any questions answered incorrectly. To receive credit for this activity, you must return the enclosed CE/CME evaluation in the enclosed envelope. For further information, refer to the "CE/CME Instructions" below.*

*This testing procedure has proven to be an effective learning tool for adults. If you have any questions about the new testing method, please contact Customer Service at 1-800-688-2421.*

1. Inline stabilization of the cervical spine is unacceptable during intubation attempts of a trauma patient.
  - A. True
  - B. False
2. Which of the following is an indication for intubation?
  - A. Oxygenation failure
  - B. PCO<sub>2</sub> greater than 60
  - C. Profound shock
  - D. Protection of patient from aspiration
  - E. All of the above
3. Which of the following is *not* part of preparation for intubation?
  - A. Thoroughly evaluating the patient
  - B. Administering lidocaine
  - C. Having laryngoscope blades ready
  - D. Verifying the integrity of the balloon on the ET tube
  - E. Having suction available

4. Which of the following patients will desaturate the fastest?
  - A. Healthy, adult male
  - B. Healthy, adult female
  - C. Healthy 6-month-old female
  - D. Healthy 12-year-old male
5. Which of the following medications is *not* part of the pretreatment phase of RSI?
  - A. Atropine
  - B. Lidocaine
  - C. Succinylcholine 0.15 mg/kg
  - D. Succinylcholine 1.5 mg/kg
  - E. Vecuronium 0.01 mg/kg
6. Which of the following induction agents would be particularly beneficial in an asthmatic patient who requires intubation?
  - A. Etomidate
  - B. Thiopental
  - C. Pentothal
  - D. Propofol
  - E. Ketamine
7. In a patient with Addison's Disease in whom etomidate is used as an induction agent, supplemental corticosteroids should be considered.
  - A. True
  - B. False
8. Which of the following is a contraindication to the use of propofol?
  - A. Allergy to albumin
  - B. Hypotension
  - C. Compromised cardiac function
  - D. Allergy to egg whites
  - E. All of the above
9. Which of the following may be used to confirm ET tube position?
  - A. Breath sounds
  - B. Quantitative capnography devices
  - C. Color change CO<sub>2</sub> detector

## 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. **After completing this activity, you must complete the evaluation form provided and return it in the reply envelope provided in order to receive a certificate of completion.** When your evaluation is received, a certificate will be mailed to you.

- D. Chest radiograph
- E. All of the above

10. Pediatric patients have a shorter time to oxygen desaturation than do adult patients.
- A. True
  - B. False

ANSWERS: 1-B; 2-E; 3-B; 4-C; 5-D; 6-E; 7-A; 8-E; 9-E; 10-A.

**Immediate certificate delivery**



**The Global Continuing Medical Education Resource**

Exciting **site improvements** include advanced search capabilities, more bulk purchasing options, certificate printing, and much more.

With **more than 1100 hours** of credit available, keeping up with continuing education requirements has never been easier!

**Choose your area of clinical interest**

- AIDS/HIV
- Alternative Medicine
- Asthma
- Cardiology
- Contraception
- Critical Care
- Diabetes
- Emergency Medicine
- Geriatrics
- Infection Control
- Internal Medicine
- Medical Ethics
- Neurology
- OB/GYN
- Oncology
- Pediatrics
- Primary Care
- Psychiatric Medicine
- Radiology
- Sports Medicine
- TB
- Therapeutics
- Travel Medicine

**Price per Test**

As low as \$5 per test with bulk purchase option.

Log onto  
**www.CMEweb.com**

today to see how we have improved your online CME

**HOW IT WORKS**

1. **Log on at <http://www.CMEweb.com>**
2. **Complete the rapid, one-time registration process** that will define your user name and password, which you will use to log-on for future sessions. It costs nothing to register!
3. **Choose your area of interest** and enter the testing area.
4. **Select the test you wish to take** from the list of tests shown. Most tests are worth 1.5 hours of CME credit.
5. **Read the literature reviews and special articles**, answering the questions associated with each.
6. **Your test will be graded online** and your certificate delivered immediately via e-mail.

CALL **1-800-688-2421** OR E-MAIL  
CUSTOMERSERVICE@CMEWEB.COM

**ED Legal Letter** helps you minimize needless litigation.



**FREE!**

Earn up to 18 FREE hours of AMA and ACEP Category 1 CME credits, or approximately 18 nursing contact hours.

With a subscription to **ED Legal Letter**, you'll benefit from 12 monthly issues packed with the latest expert advice and authoritative guidance to help minimize needless litigation and enhance your ability to limit legal risk. Each 8- to 12-page issue covers a single topic, providing case studies and specific examples. It is meticulously written by physician/attorneys to bring you expert analyses on crucial issues such as:

- Documentation errors
- Missed diagnoses
- JCAHO and EMTALA
- High-risk complaints
- Liability from nursing activities

This information service also includes:

- A sturdy binder for storing your issues
- A FREE book for your personal library, "Ethical and Legal Issues in the ED."

Delivery every 30 days (12 issues/year), for **only \$459**, including CE/CME.

Order now. Please call **1-800-688-2421** or **1-404-262-5476** (code 6310)

Visit our Web site at [www.ahcpub.com](http://www.ahcpub.com)

# Emergency Medicine Reports

For a complete title index,  
please see page 16.

Volume 23

SUPPLEMENT

## 2002 Subject Index: Volume 23, Numbers 1-26

Entries are organized alphabetically by subject matter and key words, with entries followed by the issue number and page number (e.g., issue number 2, page 20 would be listed as 2:20). Tables are indicated by a lowercase *t*, figures by a lowercase *f*. Supplements are indicated by an uppercase *S*.

|   |  |   |
|---|--|---|
| <p><b>A</b></p> <p><b>Abacavir</b>, 538Z:6t</p> <p><b>ABC mnemonic for organic mimics</b>, 20:236-238, 237t</p> <p><b>Abdominal pain</b><br/>high-risk patients, 536Z:6<br/>right lower quadrant, in women, 1:1-13, 2t, 3f</p> <p><b>Abrasions</b>, 26:316<br/>corneal, 13:167</p> <p><b>Abscesses</b><br/>in deep spaces in hand, 25:307, 308f<br/>felon, 25:304-305<br/>perforated appendicitis and, 1:7-8, 8f</p> <p><b>Abuse</b><br/>child, 6:69, 71f<br/>sexual<br/>behavioral indicators of, 6:70, 72t<br/>complaint/exam indicators of, 6:70, 72t<br/>differential diagnosis of, 6:75-76<br/>examination, 6:71<br/>pediatric, 6:69-76<br/>physical examination techniques for, 6:72<br/>specialized forensic exam techniques for, 6:72-73</p> <p><b>ACC</b>. See American College of Cardiology</p> <p><b>ACEIs</b>. See Angiotensin-converting enzyme inhibitors</p> <p><b>Acetabulum</b>, Trauma 4:3, 4f<br/>fractures of, Trauma 4:9-10<br/>radiographic lines of, Trauma 4:4-5, 5f</p> <p><b>Acetaminophen</b><br/>for pain management, 5:55, 56t<br/>warfarin interactions, 12:154, 155t</p> <p><b>Acidic substances</b>, 13:170t</p> <p><b>ACS</b>. See Coronary syndrome, acute</p> <p><b>Actinomyces israelii</b>, 1:9</p> <p><b>Acute hand</b>, 23:275-283, 24:287-299, 25:303-311<br/>examination of, 23:279-282</p> | <p>initial evaluation of, 23:279-280<br/>motor function evaluation of, 23:282<br/>neurological evaluation of, 23:281-282<br/>sensation evaluation of, 23:281-282<br/>vascular status of, 23:280-281<br/>what not to do with, 23:281t, 283</p> <p><b>Acute hydrocele/varicocele</b>, 2:25</p> <p><b>Acute pain</b>, 5:64</p> <p><b>Acute retroviral syndrome (ARS)</b>, 538Z:3<br/>diagnosis of, 538Z:3-4<br/>differential diagnosis of, 538Z:3, 3t</p> <p><b>Acute scrotum</b>, 2:19-20, 19t</p> <p><b>Acute wounds</b>, 26:324t</p> <p><b>Acyclovir</b>, 6:77t</p> <p><b>Adenosine</b>, 4:49, 4S</p> <p><b>Adnexal torsion</b>, 1:5-6, 7t</p> <p><b>Adolescents</b>, 537Z:6-7</p> <p><b>Adrenaline</b>, 22:267-269, 268t</p> <p><b>Adrenal insufficiency</b>, 20:241</p> <p><b>Advance directives</b>, 537Z:5</p> <p><b>Adverse drug effects</b><br/>with anthrax drugs, 6S:3<br/>diagnosis of, 12:155-156<br/>in elderly, 11:147, 147t<br/>legal considerations for, 12:156<br/>reporting, 12:159<br/>with sedation and analgesia, 22:269t<br/>strategies to prevent, 12:157t, 158t</p> <p><b>AF</b>. See Atrial fibrillation</p> <p><b>Agitation</b>, 21:255t</p> <p><b>AHA</b>. See American Heart Association</p> <p><b>Airborne anthrax</b>, 11S:4</p> <p><b>Airway problems</b>, 20:236-237, 238t<br/>indicators of, 22:264, 266t<br/>pre-procedural examination of, 22:264, 266t</p> <p><b>Alcoholism</b>, 9:112t</p> <p><b>Alcohol withdrawal syndrome</b>, early-onset, 20:238</p> <p><b>Alfentanyl</b>, 21:257</p> <p><b>Alkali substances</b>, 13:170t</p> | <p><b>Allen test</b>, 23:280-281, 281f</p> <p><b>Alprazolam</b>, 22:267</p> <p><b>Alternative drug therapy</b>, 12:158</p> <p><b>American College of Cardiology/American Heart Association (ACC/AHA) heart failure classification</b>, 7:89t</p> <p><b>American Society of Anesthesiologists (ASA) classifications</b>, 22:264-265, 265t<br/>physical status classification of, 21:249, 250t</p> <p><b>Amethocaine</b>. See Tetracaine</p> <p><b>Aminoglycoside</b>, 9:112t, 119, 10:132, 137t, 138</p> <p><b>Amiodarone</b><br/>for brady-tachy syndrome, 19:227, 228t<br/>for cardioversion, 19:225<br/>for cardioversion of AF, 19:222, 223t<br/>for CHF/LV dysfunction, 19:227, 228t<br/>digoxin interactions, 12:155<br/>for ischemic heart disease/MI, 19:227, 228t<br/>for rate control, 19:220<br/>for sinus rhythm maintenance, 19:226<br/>for SVT, 4S<br/>warfarin interactions, 12:155t</p> <p><b>Amitriptyline</b>, 5:63</p> <p><b>Amoxicillin</b><br/>for CAP, 9:114t, 10:140t<br/>for UTI, 1:11</p> <p><b>Amoxicillin/clavulanate</b><br/>for bites, 26:324<br/>for CAP, 9:114t, 10:140t</p> <p><b>Amphetamines</b>, 12:155</p> <p><b>Ampicillin</b><br/>for acute bacterial prostatitis, 3:35<br/>for acute cholangitis, 17:207, 208t, 209</p> <p><b>Ampicillin/sulbactam</b>, 9:112t, 113t, 114t, 119, 10:137t, 139t, 140t</p> <p><b>Amputations</b><br/>fingertip, 24:297, 297f, 298f<br/>hand<br/>replantation of, 24:296, 298t</p> |
|---|--|---|

|   |   |   |
|---|---|---|
| <p>traumatic, 24:296-297</p> <p>treatment advances, 24:297-298</p> <p><b>Analgesia</b></p> <p>adult, agents for, 21:253t-255t</p> <p>adverse events, 22:269t</p> <p>definition of, 21:248</p> <p>implanted devices for, 5:64</p> <p>levels of, 21:248, 249t</p> <p>pediatric, drugs and reversal agents for, 21:255t-266t</p> <p>post-sedation and analgesia discharge criteria, 22:269, 269t</p> <p>for right lower quadrant abdominal pain in women, 1:3</p> <p><b>Anatomy</b></p> <p>of eye, 13:163, 165f</p> <p>of hand, 23:276-279</p> <p>of pediatric sexual abuse, 6:73-74</p> <p>of pelvis, Trauma 4:2-3</p> <p>of penis, 3:31f</p> <p>of prostate, 3:34</p> <p>of sacroiliac complex, Trauma 4:2-3</p> <p>of scrotum, 2:19, 19f</p> <p>of testis, 2:19, 19f</p> <p><b>Anesthesia</b></p> <p>local, 26:318, 318t</p> <p>topical, 22:268t</p> <p>wound, 26:318-319</p> <p><b>Angiodysplasia</b>, Geriatric 1:5-6</p> <p><b>Angiography</b></p> <p>lower GI, Geriatric 1:10</p> <p>pulmonary, 14:170</p> <p><b>Angiotensin-converting enzyme inhibitors (ACEIs)</b></p> <p>contraindications to, 8:96, 96t</p> <p>drug interactions, 12:154</p> <p>for heart failure, 8:96-97, 96t</p> <p>NSAID interactions, 12:155</p> <p><b>Angiotensin receptor blockers (ARBs)</b>, 8:96t, 97</p> <p><b>Animal bites</b>, 25:309-310, 26:324-325</p> <p>rabies prophylaxis recommendations for, 26:325, 325t</p> <p>wounds with increased risk for infection, 26:325t</p> <p><b>Anisocoria</b>, 13:174</p> <p><b>Anoscopy</b>, Geriatric 1:10</p> <p><b>Anthrax</b></p> <p>aftermath, 6S:1-4</p> <p>airborne, 11S:4</p> <p>extended treatment of, 6S:1-4</p> <p>fear of, 12S:1-3</p> <p><b>Anthrax drug adherence</b>, 6S:3</p> <p><b>Anthrax mailer</b>, 9S:3-4</p> <p><b>Antiarrhythmics</b></p> <p>class IA</p> <p>for cardioversion, 19:222-223, 223t, 225</p> <p>for rate control, 19:222t</p> <p>class IC, 19:223, 223t, 225</p> <p>class III, 19:223t, 224-225</p> <p>contraindications to, 8:105</p> <p>digoxin interactions, 12:155</p> | <p><b>Antibiotics</b></p> <p>for acute cholangitis, 17:207, 208t</p> <p>for anthrax, adherence to, 6S:3</p> <p>for appendicitis, 1:8-9</p> <p>for CAP, 9:119-120, 10:131, 136-138, 138-139</p> <p>daily drug costs, 9:116, 117t</p> <p>for hospital-based management of CAP, 9:116-117, 10:129-142</p> <p>ophthalmic, 13:168t</p> <p>for pelvic inflammatory disease, 1:9</p> <p>prophylactic, 26:323-324, 324t</p> <p>for pyelonephritis, 1:11</p> <p>topical, 26:322</p> <p>warfarin interactions, 12:154, 155t</p> <p><b>Anticoagulation therapy</b>, 8:104, 15:176-177</p> <p>complications of, 15:183-185</p> <p>duration of, 15:183, 184t</p> <p>guidelines for AF, 19:226, 226t</p> <p>importance of, 19:226</p> <p>inpatient, 8:104</p> <p>outpatient, 8:104</p> <p>patient acceptance of, 15:184</p> <p>patient education about, 15:180-181</p> <p>special considerations for, 15:183-185</p> <p>for VTE, 15:181-183</p> <p><b>Anticonvulsants</b>, 5:63</p> <p><b>Antidepressants</b>, 5:62-63</p> <p><b>Antiemetics</b>, 17:208</p> <p>for adnexal torsion, 1:6</p> <p>for medication-induced nausea and vomiting, 5:59</p> <p><b>Antifungals</b>, 12:155t</p> <p><b>Antihistamines</b></p> <p>drug interactions, 11:150</p> <p>for medication-induced nausea and vomiting, 5:59</p> <p><b>Antimicrobial Resistance Management (ARM) Database</b>, 9:122-123</p> <p><b>Antimicrobial therapy</b></p> <p>appropriate and adequate intensity of, 9:120</p> <p>for CAP, 9:109-122, 112t, 113t, 10:129-142, 139t</p> <p><b>Antipsychotics</b>, 11:150</p> <p><b>Antispasmodic agents</b>, 17:208</p> <p><b>Anxiolytic drugs</b>, 21:248</p> <p><b>Appendicitis</b>, 1:6-9</p> <p>perforated, 1:7-8, 8f</p> <p>uncomplicated, 1:7-8, 8f</p> <p><b>Appendix testis/epididymis</b>, torsion of, 2:24-25</p> <p><b>ARBs</b>. See Angiotensin receptor blockers</p> <p><b>Arrhythmias</b></p> <p>atrial tachyarrhythmias, 4:42t</p> <p>atrioventricular tachyarrhythmias, 4:42t</p> <p>ventricular, 8:105</p> <p><b>Arterial blood gases</b>, 14:168</p> <p><b>Arteries</b>, hand, 23:277-278</p> <p><b>Arthritis</b>, septic, 25:305-306</p> <p><b>ASA</b>. See American Society of Anesthesiologists</p> <p><b>ASCAP (Antibiotic Selection for Community-Acquired Pneumonia) Panel</b></p> <p>guidelines for empiric antimicrobial therapy, 9:112t, 10:137t</p> | <p>recommendations for outpatient management, 10:130-131</p> <p>treatment guidelines, 10:131-133</p> <p>Year 2002 Consensus Report Panel and Scientific Roundtable, 9:111</p> <p><b>Aspirin</b></p> <p>for AF, 19:226, 226t</p> <p>for pain management, 5:55, 56t</p> <p>warfarin interactions, 12:154</p> <p><b>Assent and dissent</b>, 537Z:4</p> <p><b>Association for Professionals in Infection Control and Epidemiology (APIC)</b>, 12S:3-4</p> <p><b>Atenolol</b>, 19:226</p> <p><b>Ativan</b>. See Lorazepam</p> <p><b>Atrial fibrillation</b>, 4:44f, 45, 47t, 18:211-216</p> <p>anticoagulation guidelines for, 19:226, 226t</p> <p>chronic, 18:214t</p> <p>classification of, 18:212, 214t</p> <p>clinical presentation of, 18:215</p> <p>coexisting illnesses, 19:226-228, 228t</p> <p>conditions associated with, 18:212-213</p> <p>diagnostic studies for, 18:215</p> <p>ECG findings in, 18:215-216, 216t, 217f</p> <p>electrophysiologic mechanisms of, 18:213</p> <p>epidemiology of, 18:212-213</p> <p>etiology of, 18:213-215</p> <p>exercise-induced, 19:227-228, 228t</p> <p>hemodynamic effects of, 18:214</p> <p>hemostatic markers of, 18:214</p> <p>management of, 19:219-229</p> <p>medications for pharmacological cardioversion of, 19:222-223, 223t</p> <p>medications for rate control in, 19:220, 222t</p> <p>neurogenic, 19:227, 228t</p> <p>outcome of, 18:213</p> <p>paroxysmal, 18:214t</p> <p>pathophysiology of, 18:213-215</p> <p>patient disposition in, 19:229</p> <p>post-surgical, 19:227, 228t</p> <p>prevalence of, 18:212, 215t</p> <p>recent-onset, 18:214t</p> <p>risk factors for, 18:215t</p> <p>risk factors for stroke in, 19:224t</p> <p>signs and symptoms of, 18:215</p> <p>special conditions in, 19:226-228, 228t</p> <p>stroke outcome for, 18:213</p> <p>treatment of, 4:46, 49f</p> <p>algorithm for, 19:221f</p> <p>goals for, 18:213t</p> <p>nonpharmacological, 19:228</p> <p><b>Atrial flutter</b>, 4:44, 47t</p> <p>with 2:1 block, 4:44, 44f</p> <p>with 4:1 conduction, 4:44, 44f</p> <p><b>Atrial remodeling</b>, 18:213-214</p> <p><b>Atrial tachyarrhythmias</b>, 4:42t</p> <p><b>Atrial tachycardia</b>, 4:43f, 44, 47t</p> <p>ectopic, 4:44</p> <p>multifocal, 4:43, 43f, 47t</p> <p><b>Atrioventricular nodal reentrant tachycardia (AVNRT)</b>, 4:45-46, 45f, 46f, 47t</p> |
|---|---|---|

**Atrioventricular node**, 18:214  
**Atrioventricular reentrant tachycardia (AVRT)**, 4:46, 47t, 48f  
**Atrioventricular tachyarrhythmias**, 4:42t  
**Avulsion injuries**, pelvic, Trauma 4:8-9  
**Avulsions**, 26:316  
**Azithromycin**, 9:122-123  
 for acute epididymitis, 2:24  
 for CAP, 9:112t, 113t, 114t, 123, 10:132, 133, 136, 137t, 139, 139t, 140t  
 for cervicitis, 1:10t  
 for chlamydia, 1:10t, 6:77t  
 daily cost, 9:117t  
 for *N. gonorrhoeae* treatment, 6:77t  
 for urethritis, 3:37  
**AZT**. See Zidovudine  
**Aztreonam**  
 for acute cholangitis, 17:208t  
 for CAP, 9:119

## B

**Bacitracin ophthalmic ointment**, 13:168t  
**Baclofen**, 5:62t  
**Bacterial endocarditis**, 20:241-242  
**Bacterial keratitis**, 13:171-172  
**Bacterial prostatitis**, acute, 3:34-35  
**Bacterial vaginosis**, 6:77t  
**Bacteroides**  
 antimicrobial therapy for, 9:119  
 in cholecystitis/cholangitis, 17:205t  
 in pelvic inflammatory disease, 1:9  
***Bacteroides fragilis***  
 antimicrobial therapy for, 9:119-120  
 in Fournier's gangrene, 3:34  
**Bactrim**. See Trimethoprim/sulfamethoxazole  
**Balanitis**, 3:31  
**Barbiturates**, 21:251-252  
**Barium enema**, Geriatric 1:10  
**Barrier precautions**, Trauma 3:5  
**BCA**. See Bichloroacetic acid  
**Behavioral indicators of sexual abuse**, 6:72t, 79  
**Bell-clapper deformity**, 2:20-21, 21f  
**Bennet's fractures**, 24:289t  
**Benzodiazepines**  
 antagonists, 21:257-258  
 for procedural sedation, 21:252  
**Beta-blockers**, 19:220  
 for brady-tachy syndrome, 19:227, 228t  
 CCB interactions, 12:154-155, 156t  
 for CHF/LV dysfunction, 19:227, 228t  
 contraindications to, 8:97t  
 for exercise-induced AF, 19:227-228, 228t  
 for heart failure, 8:97-98, 97t  
 for neurogenic AF, 19:227, 228t  
 NSAID interactions, 12:155  
 for rate control in AF, 19:222t  
 for thyrotoxicosis, 19:227, 228t  
**Beta-lactam/beta-lactamase inhibitor**, 9:112t, 113t, 114t, 119, 121-122, 10:131-132, 132, 137t, 138,

139, 139t, 140t  
**Bichloroacetic acid (BCA)**, 6:77t  
**Biliary tract disorders**, 17:203-209  
**Bioimpedance monitoring**, 7:90-91  
**Biотerrorism**, 2S:1-4, 6S:1-4, 9S:1-4, 11S:1-4, 12S:1-4  
 anthrax mailer, 9S:3-4  
 forensics, 9S:4  
 planning for, 12S:4  
 tabletop exercises, 11S:2, 3  
**Bites**, 25:309-310  
 animal, 25:309-310, 26:324-325, 325t  
 fight, 25:305t, 309, 26:324  
 human, 26:324, 325t  
**Bleeding**. See also Hemorrhage  
 gastrointestinal, Geriatric 1:7t  
 with heparin, 15:182  
 lower GI, Geriatric 1:1-11  
 upper GI  
 acute, Geriatric 1:5f  
 sites, Geriatric 1:8

**Blepharitis**, 13:170  
**Blister agents**, 2S:3  
**Blood**, Trauma 3:7  
**Blood substitutes**, Trauma 3:8  
**Body composition**, 11:148  
**Botanicals**, 12:155t  
**Brady-tachy syndrome**, 19:227, 228t  
**Breach of duty**, 536Z:3  
**Breast development**, 6:73t  
**Breathing problems**, 20:236-237, 238t  
**Brevital**. See Methohexital  
**British Anti-Lewisite (BAL)**, 2S:3  
**Bromelains**, 12:155t  
**Brown bag syndrome**, 11:146  
**B-type natriuretic peptide**, 7:89-90  
**Bumetanide**  
 for acute heart failure, 8:98t  
 for acute pulmonary edema, 8:95  
**Bupivacaine (Marcaine)**, 26:318t  
**Bupivacaine with epinephrine**, 26:318t  
**Buprenorphine**  
 for pain management, 5:62  
 starting dose, 5:61t  
**Burns/chemical exposure**, ocular, 13:168-169  
**Butorphanol**, 5:61t

## C

**Calcium**, 18:214  
**Calcium channel blockers (CCBs)**  
 for CHF/LV dysfunction, 19:227, 228t  
 contraindications to, 8:104  
 drug interactions, 12:154-155, 156t  
 for rate control in AF, 19:222t  
**Calf vein thrombosis**, 15:186  
**California**, 535Z:5t  
**Cancer**  
 colorectal, Geriatric 1:6  
 penile, 3:34

prostate, 3:35  
 testicular, 2:26  
**Candida albicans**, 6:76  
**CAP**. See Community-acquired pneumonia  
**Capnocytophaga canimorsus**, 26:324  
**Capsaicin**, 5:62  
**Captopril**, 8:96t  
**Carbamazepine**  
**CCB interactions**, 12:156t  
 for pain management, 5:63  
**Cardiac ICU**, 8:105t  
**Cardiac monitoring**, 7:88  
**Cardiac output**, low, 7:87, 87t  
**Cardiogenic shock**, 7:85, 8:105  
 diagnosis of, 7:85, 85t  
 etiologies of, 7:84, 84t  
 management strategies for, 8:95  
**Cardiologists**, 19:229  
**Cardiovascular disturbances**, 20:237-238, 238t  
**Cardiovascular function**, 11:148-149  
**Cardioversion**, 19:220-225  
 complications of, 19:225  
 electrical  
 considerations for, 19:223-224  
 pharmacologically augmented, 19:224  
 hemodynamic changes after, 18:215  
 medications for, 19:224-225  
 methods for, 19:225  
 pharmacological, 19:222-223, 224  
**Carisoprolol**, 5:62t  
**Carvedilol**  
 for chronic systolic heart failure, 8:97t  
 for heart failure, 8:97  
**Cat bites**, 26:325, 325t  
**Catheter ablation**, endocardial, 19:228  
**Catheters**. See also Foley catheter  
 epidural, 5:64  
**Causation**, 536Z:3  
**Caval filters**, 15:185-186  
**Cavernous sinus thrombosis**, 13:174-175  
**CCBs**. See Calcium channel blockers  
**Cefadroxil**, 1:11  
**Cefepime**, 9:112t  
 for CAP, 9:113t, 10:137t, 139t  
**Cefixime**, 1:10t, 6:77t  
**Cefmetazole**, 9:119  
**Cefoperazone**, 9:119  
**Cefotaxime**  
 for CAP, 9:112t, 113t, 114t, 119, 10:133, 137t, 138, 139t, 140t  
 daily cost, 9:117t  
 for *S. pneumoniae*, 9:122-123  
 year 2002 NCCLS breakpoints, 9:119  
**Cefotetan**, 9:119  
**Cefoxitin**, 9:119  
**Ceftazidime**, 9:119  
**Ceftizoxime**, 10:138  
**Ceftriaxone**  
 for acute epididymitis, 2:24  
 breakpoints, 9:119

|  |  |  |
|--|--|--|
| <p>for CAP, 9:112t, 113t, 114t, 119, 121-122, 10:131-132, 137t, 138, 139, 139t, 140t</p> <p>for conjunctivitis, 13:171</p> <p>daily cost, 9:117t</p> <p>for gonorrhea, 1:10t, 6:77t</p> <p>for pyelonephritis, 1:11</p> <p>for <i>S. pneumoniae</i>, 9:122-123</p> <p>for urethritis, 3:37</p> <p><b>Cefuroxime</b>, 9:114t, 119, 10:138, 140t</p> <p><b>Celecoxib</b>, 5:57t, 58</p> <p><b>Cell-saver techniques</b>, Trauma 3:8</p> <p><b>Cellulitis</b></p> <ul style="list-style-type: none"> <li>hand, 25:306</li> <li>periorbital (preseptal)/orbital, 13:173</li> </ul> <p><b>Centers for Disease Control and Prevention (CDC)</b></p> <p><b>Drug-Resistant <i>Streptococcus pneumoniae</i> Therapeutic Working Group (CDC-DRSPWG)</b></p> <p>guidelines for antibiotic therapy of CAP, 10:138-139</p> <p>recommended year 2000 empiric regimens for CAP, 9:114t, 10:140t</p> <p>extended anthrax treatment offer, 6S:1-4</p> <p>recommendations for action against bioterrorism, 9S:2</p> <p>recommendations for tetanus prophylaxis, 26:323</p> <p>smallpox plan, 12S:3-4</p> <p><b>Central nervous system disturbances</b>, 20:237-238, 238t</p> <p><b>Central retinal artery occlusion</b>, 13:173-174</p> <p><b>Central retinal vein occlusion</b>, 13:174</p> <p><b>Cephalosporins</b></p> <ul style="list-style-type: none"> <li>for bites, 26:324</li> <li>for CAP, 9:113t, 119, 10:131-132, 138</li> <li>for fingertip amputation, 24:297</li> <li>third-generation</li> <li>for acute cholangitis, 17:208t, 209</li> <li>for CAP, 9:119</li> </ul> <p><b>Cervicitis</b>, 1:9, 10t</p> <p><b>Chalazia</b>, 13:171</p> <p><b>Chemical exposures</b></p> <ul style="list-style-type: none"> <li>ocular, 13:168-169, 170t</li> <li>signs and symptoms of, 2S:3</li> <li>triage, 2S:2</li> </ul> <p><b>Chest pain</b>, 536Z:5-6</p> <p><b>Chest radiography (CXR)</b></p> <ul style="list-style-type: none"> <li>in heart failure, 7:90, 91t</li> <li>portable, 7:91t</li> <li>in venous thromboembolism, 14:167-168</li> </ul> <p><b>Child abuse</b>, 6:69, 71f</p> <p><b>Children</b>. See also Pediatric patients</p> <ul style="list-style-type: none"> <li>assent or dissent from, 537Z:4</li> <li>NPO status for, 22:263-264, 264t</li> <li>pain control in, 5:65</li> <li>STD testing and prophylaxis for, 6:75</li> </ul> <p><b>Children's rights</b>, 537Z:1-9</p> <p><b>Chlamydia</b></p> <ul style="list-style-type: none"> <li>in acute epididymitis, 2:24</li> <li>empiric antibiotic coverage for, 10:136</li> <li>in PID, 1:9</li> <li>prophylaxis of, 6:77t</li> </ul> | <p>treatment of, 1:10t, 6:77t</p> <p><b><i>Chlamydia pneumoniae</i></b></p> <ul style="list-style-type: none"> <li>antimicrobial therapy for, 9:119, 120</li> <li>combination therapy for, 9:123, 10:132</li> <li>outpatient management of, 10:130, 131</li> <li>in pneumonia, 10:136, 138, 139t</li> </ul> <p><b><i>Chlamydia psittaci</i></b>, 10:138</p> <p><b><i>Chlamydia trachomatis</i></b>, 3:37</p> <p><b>Chloral hydrate</b></p> <ul style="list-style-type: none"> <li>for procedural sedation, 21:250</li> <li>for sedation for pediatric CT and MRI scans, 22:267</li> </ul> <p><b>Chloride</b>, 2S:3</p> <p><b>Chlorphenesin</b>, 5:62t</p> <p><b>Chlorpromazine (Phenergan)</b>, 21:249</p> <p><b>Chlorzoxazine</b>, 5:62t</p> <p><b>Cholangitis</b></p> <ul style="list-style-type: none"> <li>acute, 17:208t</li> <li>antibiotics for, 17:207</li> <li>bacterial pathogens associated with, 17:205</li> <li>clinical manifestations of, 17:205, 206t</li> </ul> <p><b>Cholecystitis</b>, 17:203-209</p> <ul style="list-style-type: none"> <li>bacterial pathogens associated with, 17:205, 205t</li> <li>clinical presentation of, 17:205, 206t</li> <li>complications of, 17:207-208</li> <li>diagnosis of, 17:205-206</li> <li>differential diagnosis of, 17:206-207</li> <li>pathophysiology of, 17:204-205</li> <li>treatment of, 17:208-209</li> </ul> <p><b>Cholelithiasis</b>, 17:203-209</p> <ul style="list-style-type: none"> <li>bacterial pathogens associated with, 17:205t</li> <li>clinical presentation of, 17:205, 206t</li> <li>complications of, 17:207-208</li> <li>diagnosis of, 17:205-206</li> <li>differential diagnosis of, 17:206-207</li> <li>pathophysiology of, 17:204-205</li> <li>treatment of, 17:208-209</li> </ul> <p><b>Choline magnesium trisalicylate</b>, 5:56t</p> <p><b>Chronic pain</b>, 5:64-65</p> <p><b>Ciprofloxacin (Cipro)</b></p> <ul style="list-style-type: none"> <li>for acute cholangitis, 17:207, 208t</li> <li>for acute epididymitis, 2:24</li> <li>for CAP, 9:112t, 113t, 10:137t, 139t</li> <li>daily cost, 9:117t</li> <li>drops, 13:168t</li> <li>for gonorrhea, 1:10t, 6:77t</li> <li>for pyelonephritis, 1:11</li> <li>resistance to, 10:135</li> <li>for UTI, 1:10</li> <li>warfarin interactions, 12:154, 155t</li> </ul> <p><b>Clarithromycin</b>, 9:122-123</p> <ul style="list-style-type: none"> <li>for CAP, 9:113t, 114t, 10:139, 139t, 140t</li> <li>digoxin interactions, 12:155</li> <li>warfarin interactions, 12:154, 155t</li> </ul> <p><b>Clavulanate</b></p> <ul style="list-style-type: none"> <li>for acute cholangitis, 17:208t</li> <li>for bites, 26:324</li> <li>for CAP, 9:112t, 114t, 10:133, 137t, 140t</li> </ul> <p><b>Cleaning the hand</b>, 23:282</p> <p><b>Clenched-fist injuries</b>, 26:324</p> | <p><b>Clindamycin</b></p> <ul style="list-style-type: none"> <li>for acute cholangitis, 17:208t, 209</li> <li>for CAP, 9:112t, 113t, 119, 10:132, 137t, 139t</li> <li>for gonorrhea, 1:10t</li> </ul> <p><b>Clinical guidelines/pathways</b>, 12:157-158</p> <p><b>Clitoris</b>, 6:73</p> <p><b>Clonidine</b>, 5:62</p> <p><b>Closed head injury</b>, Trauma 3:9</p> <p><b>Clostridium</b></p> <ul style="list-style-type: none"> <li>in cholecystitis/cholangitis, 17:205, 205t</li> <li>in infectious diarrhea, Geriatric 1:9</li> </ul> <p><b>CLOT (Cost-Lowering Options for optimizing outcomes in Thrombosis) analysis</b>, 16:199</p> <p><b>Coagulation factors</b>, Trauma 3:7</p> <p><b>Cocaine</b></p> <ul style="list-style-type: none"> <li>serotonergic drug interactions, 12:155</li> <li>TAC solution or gel, 22:267-269, 268t</li> </ul> <p><b>Codeine</b></p> <ul style="list-style-type: none"> <li>for pain management, 5:60-61</li> <li>starting dose, 5:61t</li> </ul> <p><b>Colitis</b></p> <ul style="list-style-type: none"> <li>diversion, Geriatric 1:9</li> <li>ischemic, Geriatric 1:6-7</li> <li>ulcerative, Geriatric 1:9</li> </ul> <p><b>Collateral ligaments</b>, 23:276, 277f, 24:290f</p> <p><b>Colloids</b>, Trauma 3:6</p> <p><b>Colonic diverticulosis</b>, Geriatric 1:4-5</p> <p><b>Colonic polyps</b>, Geriatric 1:9</p> <p><b>Colonic varices</b>, Geriatric 1:9</p> <p><b>Colonoscopy</b>, Geriatric 1:10</p> <p><b>Colorectal carcinoma</b>, Geriatric 1:6</p> <p><b>Communication with staff</b>, 12:158</p> <p><b>Community-acquired pneumonia (CAP)</b></p> <ul style="list-style-type: none"> <li>antibiotic therapy for</li> <li>consensus guidelines for, 10:138-139</li> <li>empiric, 10:136-138</li> <li>selection for hospitalized patients, 9:116-117, 10:129-142</li> <li>antimicrobial therapy for, 9:119-120, 10:129-142</li> <li>empiric, 9:112t, 113t, 10:137t</li> <li>guidelines for, 9:112t, 113t, 10:139t</li> <li>ASCAP 2002 Consensus Report Panel and Scientific Roundtable, 9:111</li> <li>ASCAP treatment guidelines for, 10:131-133</li> <li>combination therapy for, 9:123, 10:131-133</li> <li>critical pathways and protocols for, 10:132</li> <li>diagnosis of, 9:111-115</li> <li>empiric therapy for, 9:114t, 10:140t</li> <li>epidemiology of, 9:111-115</li> <li>evaluation of, 9:111-115</li> <li>in-hospital management of, 9:115-116, 10:131-133</li> <li>guidelines for, 9:109-122, 10:137t, 139t</li> <li>initial stabilization and adjunctive measures for, 9:113-115</li> <li>outcome-effective strategies for, 9:109-122</li> <li>outcome-optimizing regimens for, 9:121-122</li> <li>outpatient management of, 9:115-116</li> <li>ASCAP consensus panel recommendations for, 10:130-131</li> </ul> |
|--|--|--|

guidelines for, 10:137t, 139t  
pathogens in, 10:138  
patient disposition in, 9:115  
patient management recommendations, 10:  
130-131  
prevention of DVT in, 10:139-142  
prognostic scoring for, 9:115-116  
signs and symptoms of, 9:113  
treatment guidelines for, 9:120-121

**Compartment syndrome**, 25:310

**Computed tomography**. See CT scans

**Confidentiality**, 537Z:7-8

**Congestive heart failure**, 19:227, 228t  
DVT prevention in, 7S, 8S, S02101:3t

**Conjunctivitis**, 13:171

**Conscious sedation**

definition of, 21:248  
sample discharge instructions form, 22:270f

**Consent**

for emergency treatment, 537Z:4  
informed, 537Z:1-3, 3-4  
by minors, 537Z:4-5

**Constipation**, Geriatric 1:9

**Consultation**

with cardiologist, 19:229  
drug information resources, 12:157t  
with ophthalmologist, 13:175

**Corneal abrasion**, 13:167

**Corneal foreign bodies**, 13:167

**Corneal lacerations**, 13:169

**Coronary syndrome, acute (ACS)**, 8:101-102

**Coumadin**, 12:155

**Counseling**, stress, 11S:1-4

**COX-2 inhibitors**, 5:58

*Coxiella burnetti*, 10:138

**Crohn's disease**, Geriatric 1:9

**Crush wounds**, 26:316

**Cryotherapy**, 6:77t

**Crystalloids**, Trauma 3:6

**CT scans**, Geriatric 1:10

helical, 14:169  
pediatric, 22:266-267  
sedation for, 22:266-267  
for venous thromboembolism, 14:169

**Cushing's syndrome**, 20:241

**Cyanide**, 2S:3

**Cyanocrylate glues**, 13:169

**Cyclobenzaprine**, 5:62t

**Cytochrome P450 enzyme inhibitors and inducers**,  
11:149t, 150

**Cytomegalovirus (CMV) retinitis**, 13:175

## D

**Dacrocystitis**, 13:170

**Damage caps**, 536Z:4

**Damages**, 536Z:3

**Danshen**, 12:155t

**D-dimer test**

for pulmonary embolism, 14:170f, 171

for venous thromboembolism, 14:169, 170f, 171

**Decontamination**, chemical, 2S:2

**Deep space infections**, 25:307-308, 308f

**Deep venous thrombosis (DVT)**

diagnostic algorithm for, 14S  
differential diagnosis of, 14:166t, 167, 16:193,  
194t  
patient risk stratification for, 16:194-195,  
S02101:3-4  
pre-test probability for, 14:167, 167t  
prophylaxis of in community-acquired pneumonia,  
10:139-142  
exclusionary criteria for, S02101:6t, 7  
guidelines for, 7S, 8S  
in heart failure, S02101:1-7  
heparins for, 15:177-178  
indications for, S02101:2, 3t  
MEDENOX trial, 10:141-142, 16:195-197,  
S02101:4-5  
national guidelines for, 16:191-200  
pharmacoeconomic issues and analysis, S02101:  
6-7  
PRIME study group, 16:197-199, S02101:5-6  
PRINCE study, 16:197, S02101:5  
risk factors for hospitalized patients, S02101:  
1, 3t  
SOS (Sick, Old, Surgery) DVT QuickSCREEN<sup>®</sup>,  
16:193  
treatment of, 15:175-186  
heparins for, 15:177-178  
hospital vs. outpatient therapy, 15:179-181

**Demerol**. See Meperidine

**Depression**, 20:243

**Dermabond**, 26:321

**Development**, 6:73t

**Dexamethasone**, Geriatric 2:9t

**Dextromethorphan**, 12:155

**Diabetic retinopathy**, 13:175

**Diarrhea**, infectious, Geriatric 1:9

**Diazepam**, 5:62t

for procedural sedation, 21:252  
for sedation for pediatric CT and MRI scans,  
22:267

**Didanosine**, 538Z:6t

**Digoxin**, 19:223

for brady-tachy syndrome, 19:227, 228t  
CCB interactions, 12:154-155, 156t  
for CHF/LV dysfunction, 19:227, 228t  
drug interactions, 12:155  
for heart failure, 8:98-99  
NSAID interactions, 12:155  
for rate control in AF, 19:220, 222t  
for SVT, 4:49, 4S

**Diltiazem**

CCB interactions, 12:155  
for rate control in AF, 19:220, 222t  
for SVT, 4:49, 4S

**Diphenhydramine**, 26:318

drug interactions, 11:150  
for medication-induced nausea and vomiting, 5:59

**DIP joint dislocations**, 24:291

**Diprivan**. See Propofol

**Discharge instructions/prescriptions**, 12:158-159

minimal criteria for early discharge, 15:182  
post-sedation and analgesia discharge criteria,  
22:269, 269t  
for procedural sedation, 22:269-270  
sample discharge instructions form for conscious  
sedation, 22:270f

**Dislocations**

DIP joint, 24:291  
of hand bones, 24:290-291  
lens, 13:170  
MP joint, 24:292  
PIP joint, 24:291, 291f

**Disopyramide**

for cardioversion, 19:222, 223t, 225  
for neurogenic AF, 19:227, 228t  
for sinus rhythm maintenance, 19:226

**Dissent**, 537Z:4

**Dissociative agents**, 21:254t

**Dissociative sedation**, 21:248

**Distal phalanx fractures**, 24:287-288

**Distal tuft fracture**, 24:289t

**Disulfiram**, 12:155t

**Diuretics**, 8:97, 98t, 99

**Diversion colitis**, Geriatric 1:9

**Dobutamine**, 8:102t, 103-104

**Dofetilide**

for cardioversion, 19:223t, 224-225  
for CHF/LV dysfunction, 19:227, 228t  
for ischemic heart disease/MI, 19:227, 228t  
for rate control, 19:220  
for sinus rhythm maintenance, 19:226

**Dog bites**, 26:325, 325t

**Domestic violence**, 535Z:1-5

**Dong quai**, 12:155t

**Dopamine**, 8:102-103, 102t

**Doppler probe**, 2:22, 22f

**Dorsal slit procedure**, 3:32, 32f

**Doxycycline**

for acute epididymitis, 2:24  
for CAP, 9:113t, 114t, 10:139t, 140t  
for chlamydia, 1:10t, 6:77t  
for conjunctivitis, 13:171  
for gonorrhea, 1:10t, 6:77t  
for urethritis, 3:37

**Dressings**, 26:322-323

**Droperidol (Inapsine)**, 21:255t, 258

**Drug information resources**, 12:157t

**Drug interactions**, 11:150, 12:155

**Drug prescriptions**, 12:158-159

**Drugs**. See also Over-the-counter (OTC) medications;  
specific drugs  
of abuse (DOA), 20:238-239  
anthrax, 6S:3  
anxiolytic, 21:248  
for cardioversion, 19:222-223, 223t, 224-225  
high-risk, 12:153-155, 155t  
hypnotic, 21:248

initial dosing, 12:158  
neuropsychiatric side effects of, 20:238-239, 239t  
P450 enzyme inhibitors and inducers, 11:149t, 150  
serotonergic, 12:155  
with similar appearance, 11:147-148, 148t  
with similar names, 11:147-148, 148t  
for VTE, 16:192-193

**Drug screens**, 12:157

**Duty**, 536Z:2-3

**DVT**. See Deep venous thrombosis

## E

**Early discharge criteria**, 15:182

**Echocardiography**

in AF, 18:216

in heart failure, 7:90

for venous thromboembolism, 14:169

**Ectopic pregnancy**, 1:4-5

delayed or missed diagnosis of, 1:5t

risk factors for, 1:4t

**Education**

anticoagulation therapy, 15:180-181

intimate partner violence, 535Z:4

polypharmacy self-education, 12:156-157

**Efavirenz**, 538Z:6t

**Eikenella corrodens**, 25:309, 26:324

**Elderly**

adverse drug effects in, 11:147, 147t

CAP in, 9:112t

DVT prophylaxis in, S02101:3t

hyperthyroidism in, Geriatric 2:1-10, 10t

hypothyroidism in, Geriatric 2:1-10

initial trauma management in, Trauma 3:9-10

lower GI bleeding in, Geriatric 1:1-11, 2t

pain control in, 5:65-66

polypharmacy in, 11:145-150, 12:153-159

vulnerability to polypharmacy, 11:147-148

**Electrical cardioversion**

considerations for, 19:223-224

pharmacologically augmented, 19:224

**Electrocardiography**, 7:88

findings in AF, 18:215-216, 216t, 217f

with venous thromboembolism, 14:168

**Electrolytes**, 20:239-241, 239t

**Embolism**, pulmonary

diagnosis of, 14:171

diagnostic algorithm for, 14S

differential diagnosis of, 14:166t, 167

pre-test probability for, 14:167, 167t

**EMLA (eutectic mixture of local anesthetics)**

**cream**, 22:267, 268t

**Enalapril**, 8:96t

**Endocardial radiofrequency catheter ablation**,  
19:228

**Endocarditis**, bacterial, 20:241-242

**Endocrinology**, 20:239-241, 239t

**Endometriosis**, 1:12-13

**Endophthalmitis**, 13:172

**Enoxaparin**

for DVT prophylaxis, 10:141-142, 16:193, 195f,

S02101:3t, 5-6, 6-7

PRIME study group, 16:197-199, S02101:5-6

PRINCE study, 16:197, S02101:5

for VTE prevention, 16:197t, 199

**Enterobacter**

in animal bites, 26:324

in prostatitis, 3:35

**Enterococcus**

in cholecystitis/choolangitis, 17:205t

in UTI and pyelonephritis, 1:10

**Enzathine penicillin**, 6:77t

**Epididymis**, appendix, torsion of, 2:24-25

**Epididymitis**, acute, 2:20t, 23-24

**Epidural catheters**, 5:64

**Epinephrine**

bupivacaine with, 26:318t

LET solution or gel, 22:268t, 269

lidocaine with, 26:318t

procaine with, 26:318t

**Episcleritis**, 13:172

**Erythrocyte sedimentation rate**, Geriatric 2:2

**Erythromycin**

for CAP, 9:112t, 113t, 114t, 10:139, 139t, 140t

for cervicitis, 1:10t

for chlamydia, 6:77t

daily cost, 9:117t

digoxin interactions, 12:155

ophthalmic ointment, 13:168t

warfarin interactions, 12:154, 155t

**Escherichia coli**

in acute epididymitis, 2:24

antimicrobial therapy for, 9:120

in cholecystitis/choolangitis, 17:205, 205t

in Fournier's gangrene, 3:34

in gallbladder disease, 17:207

monotherapy vs. combination therapy for, 10:132

in PID, 1:9

in prostatitis, 3:35

in UTI and pyelonephritis, 1:10

**Esmolol**

for rate control in AF, 19:220, 222t

for SVT, 4:49, 4S

or thyroid storm, Geriatric 2:9, 9t

**Ethacrynic acid**, 8:98t

**Ethical issues**, 537Z:1-9

**Ethicon**, 26:321

**Etodolac**, 5:57, 57t

**Etomidate**

for adult sedation and analgesia, 21:253t

cost of, 21:258t

for procedural sedation, 21:250-251

**Eutectic mixture of local anesthetics (EMLA)**

**cream**, 22:267, 268t

**Evidence collection**, 6:74-75

**Exercise-induced AF**, 19:227-228, 228t

**Experts**, qualification of, 536Z:3-4

**Extensor tendons**, 23:277

injuries of, 24:292t, 293-294

insertions in finger, 23:277, 280f

zones of, 23:276, 278f, 24:293, 293f

**Extracorporeal shock wave lithotripsy**, 17:209

**Eye**

examination of, 13:163-166

gross anatomy of, 13:163, 165f

red, 13:171-173

**Eye injuries**

non-traumatic, 13:170-171

traumatic, 13:166-170

**Eyelid lacerations**, 13:167

## F

**Facial fractures**, 13:166-167

**Famciclovir**, 6:77t

**Fasting**, 21:258-259, 259t

**"Fast Track" drugs**, 11:148

**Fear of anthrax**, 12S:1-3

**Felon**, 25:304-305, 306f

**Fenoprofen**, 5:58

**Fentanyl (Sublimaze)**

for adult sedation and analgesia, 21:253t

cost of, 21:258t

for pain management, 5:62

for pediatric sedation and analgesia, 21:255t

for procedural sedation, 21:252-257

**Fever (and a chill)**, 20:241-242

**Fibroids**, uterine, 1:13

**Fight bites**, 25:305t, 309, 26:324

**Fingers**

collateral ligaments surrounding joints of, 23:276, 277f

extensor tendon insertions in, 23:277, 280f

flexor digitorum profundus tendon insertions in,  
23:276-277, 279f

flexor digitorum superficialis tendon insertions in,  
23:276-277, 279f

**Fingertip amputations**, 24:297, 297f, 298f

**Flecainide**

for cardioversion, 19:222, 223, 223t, 225

for left ventricular hypertrophy, 19:227, 228t

for neurogenic AF, 19:227, 228t

for rate control, 19:220

for sinus rhythm maintenance, 19:226

**Flexor digitorum profundus tendon**, 23:276-277,  
279f

**Flexor digitorum superficialis tendon**, 23:276-277,  
279f

**Flexor tendons**, 23:276-277

injuries of, 24:292t, 294-295

pulleys of, 23:277, 279f

sheaths and bursae of, 23:277, 280f, 25:307f

zones of, 23:276, 278f, 24:295, 295f

**Flexor tenosynovitis**, 25:305

**Fluconazole**, 12:155t

**Fluid resuscitation**

delayed, Trauma 3:8

initial phase, Trauma 3:1-10

**Flumazenil (Mazicon)**, 21:257-258

for reversal of adult sedation, 21:254t  
for reversal of pediatric sedation, 21:256t

### Fluoroquinolones

for CAP, 9:113t, 114t, 10:132, 138, 139, 139t, 140t  
extended spectrum, 10:133-136  
and methicillin-resistant *S. aureus* (MRSA), 10:135  
over-extended spectrum of coverage, 10:134-135  
for pyelonephritis, 1:11  
resistance to, 9:117-118, 10:134-135  
selective use of, 10:135-136  
for urethritis, 3:37

**Fluoxetine**, 12:155

**Flurbiprofen**, 5:56t

### Foley catheter

non-deflating, 3:37  
placement of, 3:36, 36f

### Foreign bodies

corneal, 13:167  
in hand, 25:311  
intraocular, 13:169  
urethral, 3:37  
in wounds, 26:318

### Forensics

bioterrorism, 9S:4  
specialized techniques for sexual abuse, 6:72-73

**Forrester classification**, 7:85, 85t

**Fosphenytoin**, 5:63

**Fossa navicularis**, 6:73

**Fournier's gangrene**, 3:33-34

### Fractures

of acetabulum, Trauma 4:9-10  
Bennett's, 24:289t  
of distal phalanx, 24:287-288  
distal tuft, 24:289t  
facial, 13:166-167  
of hand, 24:287-290, 289t  
metacarpal (digits 2-5), 24:289-290, 289t  
pelvic, Trauma 4:1-10  
penile, 3:34  
proximal and middle phalanx, 24:288-289, 289t  
Rolando's, 24:289t  
terminology for, 24:289t  
thumb, 24:289t, 290

**Francisella tularensis**, 10:138

### Furosemide

for acute heart failure, 8:98t  
for acute pulmonary edema, 8:95

## G

**Gabapentin**, 5:63

### Gallbladder disease

clinical manifestations of, 17:205, 206t  
evaluation of, 17:206, 207t

**Gamekeeper's thumb**, 24:292

**Gangrene**, Fournier's, 3:33-34

**Gardnerella vaginalis**, 1:9

**Garlic**, 12:155t

**Gastric vascular anomalies**, Geriatric 1:10

### Gastrointestinal bleeding

lower, in elderly, Geriatric 1:1-11, 2t  
acute, Geriatric 1:5f, 6t  
causes of, Geriatric 1:4-10, 4t  
sources of, Geriatric 1:7t  
upper, in elderly  
acute, Geriatric 1:5f  
sites of, Geriatric 1:8

**Gastrointestinal function**, 11:149

**Gatifloxacin**, 10:134

for CAP, 9:112t, 113t, 114t, 10:137t, 139t, 140t

**Genitalia**, male, 6:73t

### Gentamicin

for acute bacterial prostatitis, 3:35  
for acute cholangitis, 17:207, 208t, 209  
ophthalmic ointment, 13:168t  
ophthalmic solution, 13:168t

**Geriatric patients**. See Elderly

**Giant cell arteritis**, 13:175

**Ginkgo biloba**, 12:155t

**Glaucoma**, 13:172-173

**Globe luxation**, 13:170

**Globe rupture**, 13:169

**Glucocorticoids**, Geriatric 2:9, 9t

**Glues**, cyanoacrylate, 13:169

**Glycopyrrolate**, 17:208

**GnRH analogs**, 1:13

**Gonorrhea**. See *Neisseria gonorrhoea*

**Guanethidine**, Geriatric 2:9

## H

### *Haemophilus influenzae*

advanced generation macrolides for, 9:122  
antimicrobial therapy for, 9:119, 120  
combination therapy for, 9:123, 10:132  
empiric antibiotic coverage for, 10:136  
outpatient management of, 10:130, 131  
in PID, 1:9  
in pneumonia, 10:136, 138

**Haldol**. See Haloperidol

**Haloperidol (Haldol)**, 21:255t, 258

### Hand

acute, 23:275-283, 24:287-299, 25:303-311  
amputated, replantation of, 24:296, 298t  
anatomy of, 23:276-279  
cleaning, 23:282  
dislocations of, 24:290-291  
fractures of, 24:287-290, 289t  
human bites to, 26:325t  
intrinsic muscles of, 23:277  
mangled, 24:298-299  
tendon injuries, 24:292-295  
traumatic amputations of, 24:296-297  
trauma to, 24:287-290

**Hand cellulitis**, 25:306

**Hand infections**, 25:303-308

danger signs, 25:303, 305t

deep space, 25:307-308, 308f  
mimics, 25:303-304

### Hand injuries

bites, 25:309-310  
high-pressure injection injuries, 25:310-311  
neurovascular, 24:295-296

**Hand problems**, 25:309-311

foreign bodies, 25:311  
pediatric, 25:308-309

**Head injury**, closed, Trauma 3:9

### Heart

in hypothyroidism, Geriatric 2:3  
in thyrotoxicosis, Geriatric 2:7

### Heart failure

ACC/AHA classification of, 7:89t  
acute  
diuretics for, 8:98t, 99  
inotropic therapy for, 8:102, 103t  
anticoagulation for, 8:104  
chronic systolic  
ACEIs/ARBs for, 8:96-97, 97t  
beta-blockers for, 8:97-98, 97t  
clinical pathophysiology of, 7:84-85  
clinical presentation of, 7:83  
congestive, 19:227, 228t  
decompensated, 7:86-87, 8:105  
acute, 7:81-91, 86f, 8:93-105  
causes of, 7:87t  
diagnosis of, 7:87  
management strategies for, 8:95-96  
precipitants of, 7:88t  
definitions and categories of, 7:83-84  
diagnosis of, 7:87t, 88  
diastolic, 7:83t, 84  
differential diagnosis of, 7:87-88, 90t  
DVT prevention in, 7S, 8S  
ECG, 7:88  
etiologies of, 7:84, 84t  
Forrester classification of, 7:85, 85t  
history, 7:88  
indications for admission to cardiac ICU, 8:105t  
initial stabilization measures, 8:93-95  
inpatient therapy for, 8:104  
laboratory evaluation of, 7:88-89  
management strategies for, 8:95-96  
NYHA classification of, 7:88t  
outpatient therapy for, 8:104  
parameters of, 7:91t  
patient disposition in, 8:105  
pharmacotherapeutic strategies for, 8:96-100  
physical examination of, 7:88  
portable CXR findings in, 7:91t  
prevention of DVT in, S02101:1-7  
prevention of VTE in, S02101:7  
radiographic modalities in, 7:90-91  
systolic vs. diastolic, 7:83-84  
therapeutic approaches to be avoided in, 8:104-105  
vasodilators for, 8:100, 100t  
without signs of shock, 8:96

**Helical computerized tomography**, 14:169  
**Hemodynamic status**, 7:87t  
**Hemorrhage**  
physiology of, Trauma 3:5-6  
retrobulbar, 13:170  
subconjunctival, 13:167  
vitreous, 13:173  
**Heparin**  
for AF, 19:222  
for DVT, 15:177-178  
low-molecular-weight (LMWH)  
indications for, 15:177-178  
interchangeability of, 15:184-185  
for VTE prophylaxis, 15:182-183, 16:199-200, S02101:7  
mechanism of action, 15:177  
pharmacokinetics, 15:177  
side effects of, 15:184  
structure of, 15:177  
unfractionated (UFH)  
for DVT prophylaxis, S02101:6-7  
limitations of, 15:181, 182t, 16:193, 194t  
for VTE prevention, 15:181-182, 16:197t, 199  
weight-based dosing of, 15:181, 181t  
**Heparin-induced thrombocytopenia**, 15:183-184  
**Hepatic function**, 11:149  
**Hepatitis B**, 6:77t  
**Hepatitis B immune globulin**, 6:77t  
**Herpes simplex virus**, 6:77t  
**High-pressure injection injuries**, 25:310-311  
**High-risk patients**  
medical malpractice and, 536Z:1-7  
presentations, 536Z:5-7  
**HIV infection**, 538Z:1-6  
epidemiology of, 538Z:1  
mucocutaneous exposure to, 538Z:5, 5t  
percutaneous exposure to, 538Z:5, 5t  
post-exposure evaluation and management of, 538Z:4-6  
post-exposure prophylaxis of, 538Z:6, 6t  
primary, 538Z:3  
prophylaxis of, 6:77t, 538Z:6, 6t  
resources, 538Z:7t  
risk factors after occupational percutaneous exposure, 538Z:2, 3t  
risk per exposure period, 538Z:2, 2t  
transmission of, 538Z:1-3  
treatment of, 6:77t  
**Hordeolum**, 13:170-171  
**Hormonal therapy**, 1:13  
**Hospital-based management**  
anticoagulation, 8:104  
of CAP, 9:113t, 114t, 115-116, 10:131-133, 140t  
antibiotic selection for, 9:116-117  
antimicrobial treatment guidelines for, 10:129-142  
combination therapy for, 9:123  
guidelines for, 9:109-122, 10:137t, 139t  
of DVT, 15:179-181  
DVT prevention in, S02101:6-7  
DVT risk factors for, S02101:1, 3t

of human bites to hand, 26:325t  
**Human bites**, 25:309-310, 26:324, 325t  
**Human diploid cell vaccine (HDCV)**, 26:325  
**Human papilloma virus**, 6:77t  
**Human tetanus immunoglobulin (HTIG)**, 26:323  
**Huntington's disease**, 20:243  
**Hydralazine/isosorbide dinitrate (ISDN)**, 8:102  
**Hydrocele/varicocele**, acute, 2:25  
**Hydrocortisone**, Geriatric 2:9t  
**Hydromorphone**  
for pain management, 5:62  
starting dose, 5:61t  
**Hydroxyzine**, 5:59  
**Hymen**, 6:73  
**Hypercalcemia**, 20:240  
**Hypercortisolemia**, 20:241  
**Hypertensive retinopathy**, 13:175  
**Hyperthermia**, 20:242  
**Hyperthyroidism**, 20:240-241, Geriatric 2:5-10  
in elderly, Geriatric 2:1-10, 10t  
laboratory testing in, Geriatric 2:7  
physical findings in, Geriatric 2:6-7  
signs and symptoms of, Geriatric 2:7t  
**Hypertonic saline**, Trauma 3:8  
**Hypheema**, 13:169-170  
**Hypnotic drugs**, 21:248  
**Hypokalemia**, 20:240  
**Hypotension**, 8:101t  
**Hypothermia**, 20:242  
**Hypothyroid crisis**, Geriatric 2:3-4, 4t  
**Hypothyroidism**, 20:240, Geriatric 2:2-5  
admission criteria for, Geriatric 2:5, 5t  
diagnosis of, Geriatric 2:2  
in elderly, Geriatric 2:1-10  
heart in, Geriatric 2:3  
laboratory testing for, Geriatric 2:3, 4  
physical examination in, Geriatric 2:2-3  
signs and symptoms of, Geriatric 2:2, 3t

## I

**Ibuprofen**, 5:56t  
for pain management, 5:58  
**Ibutilide**  
for cardioversion, 19:223, 223t, 224  
for rate control, 19:220  
for SVT, 4S  
**IDSA**. See Infectious Disease Society of America  
**Imipenem**  
for acute cholangitis, 17:208t  
for CAP, 9:112t, 113t, 119, 10:137t, 139t  
**Imiquimod**, 6:77t  
**Implanted analgesia devices**, 5:64  
**Inappropriate care requests**, 537Z:6  
**Inapsine**. See Droperidol  
**Indinavir**, 538Z:6t  
**Indomethacin**, 5:57  
for pain management, 5:57t  
**Infants**, 2:24. See also Pediatric patients

**Infection**  
animal bite wounds with increased risk for, 26:325t  
deep space, 25:307-308  
DVT prophylaxis in, S02101:3t  
hand, 25:303-308  
HIV, 538Z:1-6  
urinary tract, in women, 1:10-11  
**Infection control**, 12S:3-4  
**Infectious diarrhea**, Geriatric 1:9  
**Infectious Disease Society of America (IDSA)**,  
guidelines for antimicrobial therapy of CAP,  
9:113t, 10:138  
**Inflammatory bowel disease**, idiopathic, Geriatric  
1:8-9  
**Informed consent**, 537Z:1-3, 3-4  
**Injury**  
avulsion, to pelvis, Trauma 4:8-9  
bite, 25:309-310  
clenched-fist, 26:324  
closed head, Trauma 3:9  
deep tissue, of hand, 25:303-311  
extensor tendon, 24:292t, 293-294  
eye  
non-traumatic, 13:170-171  
traumatic, 13:166-170  
flexor tendon, 24:292t, 294-295  
high-pressure injection, 25:310-311  
missed orthopedic, 536Z:6-7  
neurovascular hand, 24:295-296  
with pelvic fracture, Trauma 4:6, 6t  
spinal cord, Trauma 3:9  
tendon, 24:292-293, 292t  
zipper injuries, 3:33  
**Inotropic therapy**, 8:102-105, 103t  
**Inpatient therapy**. See Hospital-based management  
**Intensive care unit**, treatment of CAP in, 9:113t,  
114t, 10:139t, 140t  
**Internet drug information resources**, 12:157t  
**Internuclear ophthalmoplegia**, 13:175  
**Intimate partner violence**, 535Z:1-5  
ED protocol for, 535Z:4, 4t  
education, 535Z:4  
interventions for, 535Z:3  
mandatory reporting of, 535Z:4-5, 5t  
presentation to ED, 535Z:2-3  
risk factors for, 535Z:1-2  
scope of the problem, 535Z:1  
screening and assessment of, 535Z:3  
**Intraocular foreign bodies**, 13:169  
**Intrascrotal appendages**, 2:24-25, 24f  
**Intubated patients**, 9:114t, 10:140t  
**Iodides**, Geriatric 2:9t  
**Iodine**, 19:227  
**Iontophoresis**, 22:268t, 269  
**Iopanoic acid (Telepaque)**  
for thyroid storm, Geriatric 2:9  
for thyrotoxicosis, 19:227  
**Ipodate (Oragrafin)**, Geriatric 2:9  
**Iridodialysis**, 13:170

**Ischemic colitis**, Geriatric 1:6-7  
**Ischemic heart disease/myocardial infarction**, 19:227, 228t  
**Isosorbide dinitrate (ISDN)**, 8:102  
**Itraconazole**, 12:155t

## K

**Kentucky**, 535Z:5t  
**Keratitis**, bacterial, 13:171-172  
**Ketalar**. See Ketamine  
**Ketamine (Ketalar)**  
contraindications to, 21:250, 251t  
cost of, 21:258t  
for dissociation, 21:254t  
for procedural sedation, 21:250  
for sedation of ventilated patients, 22:266  
**Ketoconazole**, 12:155t  
**Ketoprofen**, 5:56t  
for pain management, 5:58  
**Ketorolac**, 5:57t  
for pain management, 5:58  
**Kidney stones**, 1:11-12  
**Klebsiella**  
in acute epididymitis, 2:24  
antimicrobial therapy for, 9:120  
in CAP, 10:138  
in cholecystitis/cholangitis, 17:205t  
in gallbladder disease, 17:207  
monotherapy vs. combination therapy for, 10:132  
in prostatitis, 3:35  
in UTI and pyelonephritis, 1:10

## L

**Labeled RBCs**, Geriatric 1:10  
**Labial separation**, 6:72, 74f  
**Labial traction**, 6:72, 74f  
**Labia majora**, 6:73  
**Labia minora**, 6:73  
**Lacerations**, 26:316  
corneal, 13:169  
eyelid, 13:167  
**Lamivudine**, 538Z:6t  
**Langer's lines**, 26:317, 317f  
**Laser**, 6:77t  
**Laws addressing mandatory reporting of intimate partner violence**, 535Z:5t  
**Lawsuits**, 536Z:4-5  
**Left atrial appendage flow**, 18:214-215  
**Left ventricular dysfunction**, 19:227, 228t  
**Left ventricular hypertrophy**, 19:227, 228t  
**Legal issues**, 536Z:1-2  
considerations for adverse drug effects, 12:156  
lawsuits, 536Z:4-5  
mandatory reporting of intimate partner violence, 535Z:4-5, 5t  
medical malpractice, 536Z:1-7  
in pediatric sexual abuse, 6:76

**Legionella**  
antimicrobial therapy for, 9:119, 120  
in CAP, 10:136, 138  
**Legionella pneumophila**  
combination therapy for, 9:123, 10:132  
outpatient management of, 10:130, 131  
**Lens dislocation/subluxation**, 13:170  
**LET (lidocaine, epinephrine, tetracaine) solution or gel**, 22:268t, 269  
**Levofloxacin**, 10:134  
for CAP, 9:112t, 113t, 114t, 10:132, 133, 137t, 139t, 140t  
daily cost, 9:117t  
resistance to, 10:134  
**Levorphanol**, 5:61t  
**Lewisite**, 2S:3  
**Lidocaine (Xylocaine)**  
EMLA cream, 22:267, 268t  
with epinephrine, 26:318t  
**LET solution or gel**, 22:268t, 269  
for pain management, 5:63-64  
for priapism, 3:30  
topical, 5:63-64  
for wound management, 26:318-319, 318t  
**Limbic encephalitis**, 20:243  
**Lisinopril**, 8:96t  
**Lithium**  
NSAID interactions, 12:155  
for thyroid storm, Geriatric 2:9, 9t  
for thyrotoxicosis, 19:227  
**LMWH**. See Heparin, low-molecular-weight  
**Local anesthetics**, 26:318, 318t  
**Lorazepam (Ativan)**  
for adult sedation and analgesia, 21:253t  
for procedural sedation, 21:252  
for sedation of ventilated patients, 22:266  
**Losartan**, 8:96t  
**Lower GI bleeding**, Geriatric 1:1-11, 2t  
acute  
final diagnosis in, Geriatric 1:6t  
stratification of patients presenting with, Geriatric 1:5f  
causes of, Geriatric 1:4-10, 4t  
diagnostics, Geriatric 1:10  
**Lugol's iodine**  
for thyroid storm, Geriatric 2:9, 9t  
for thyrotoxicosis, 19:227  
**Luxation**, globe, 13:170  
**Lyme disease**, 20:242

## M

**Macrolides**  
advanced generation, 9:122-123  
for CAP, 9:113t, 114t, 10:131-132, 132, 137t, 138, 139, 139t, 140t  
**Male patients**  
genital development, 6:73t  
urologic emergencies, 2:17-26, 3:29-38  
urologic examination, 2:18-19

**Mallet finger deformity**, 24:293-294, 293f  
**Malpractice**, medical, 536Z:1-7  
**Mandatory reporting of intimate partner violence**, 535Z:4-5, 5t  
**Mangled hand**, 24:298-299  
**Manual detorsion of testicular torsion**, 2:23, 23f  
**Manual reduction of paraphimosis**, 3:32-33, 33f  
**Marcaine**. See Bupivacaine  
**Maze procedure**, 19:228  
**Mazicon**. See Flumazenil  
**Meckels' diverticulum**, Geriatric 1:10  
**MEDEX trial**, 10:141-142, 16:195, S02101:4-5  
results, 16:197, S02101:5  
study design, 16:195-197, S02101:4-5  
**Medical malpractice**, 536Z:1-7  
common law, 536Z:2-3  
relevant statutes, 536Z:3-4  
**Medical practice skills**, 536Z:4-5  
**Medications**. See Drugs; Over-the-counter (OTC) medications  
**Meningitis**, 20:241-242, 536Z:7  
**Meperidine (Demerol)**, 17:208  
for adult sedation and analgesia, 21:253t  
for biliary disorders, 17:208  
for pain management, 5:61  
for procedural sedation, 21:249, 252  
serotonergic drug interactions, 12:155  
starting dose, 5:61t  
**Mesenteric vascular insufficiency**, Geriatric 1:7-8  
**Metacarpal fractures (digits 2-5)**, 24:289-290, 289t  
**Metaxalone**, 5:62t  
**Methadone**, 5:61, 61t  
**Methicillin-resistant *Staphylococcus aureus* (MRSA)**, 10:135  
**Methimazole**  
for thyroid storm, Geriatric 2:9, 9t  
for thyrotoxicosis, 19:227  
**Methocarbamol**, 5:62t  
**Methohexital (Brevital)**  
for adult sedation and analgesia, 21:253t  
cost of, 21:258t  
for pediatric sedation and analgesia, 21:255t  
for procedural sedation, 21:252  
**Methotrexate**, 1:5  
**Metoclopramide**, 5:59  
**Metolazone**, 8:98t  
**Metoprolol**  
for chronic systolic heart failure, 8:97t  
for rate control in AF, 19:220, 222t  
**Metronidazole**  
for acute cholangitis, 17:207, 208t  
for bacterial vaginosis, 6:77t  
for CAP, 9:112t, 113t, 119-120, 10:137t, 139t  
for trichomonas, 6:77t  
warfarin interactions, 12:154, 155t  
**Midazolam (Versed)**  
for adult sedation and analgesia, 21:253t  
cost of, 21:258t  
for pediatric sedation and analgesia, 21:255t, 22:267

for procedural sedation, 21:252, 257  
 for sedation of ventilated patients, 22:266  
**Middle phalanx fractures**, 24:288-289, 289t  
**Milrinone**, 8:102t, 104  
**Minors**, consent by, 537Z:4-5  
**Mirfentanil**, 21:257  
**Mississippi**, 535Z:5t  
**Modified Ramsay Score**, 22:265  
 for procedural sedation, 22:267t  
**Monoamine oxidase inhibitors**, 12:155  
**Monobactam**, 9:119  
**Moraxella catarrhalis**  
 antimicrobial therapy for, 9:120  
 in CAP, 10:138  
 combination therapy for, 9:123, 10:132  
 empiric antibiotic coverage for, 10:136  
 outpatient management of, 10:130, 131  
 in pneumonia, 10:136  
**Morphine**  
 for adult sedation and analgesia, 21:253t  
 cost of, 21:258t  
 for heart failure, 8:102  
 for pain management, 5:60  
 for procedural sedation, 21:252  
 starting dose, 5:61t  
**Motor function evaluation, acute hand**, 23:282  
**Moxifloxacin**, 10:133-134  
 for CAP, 9:112t, 113t, 114t, 10:137t, 139t, 140t  
**MP joint dislocations**, 24:292  
**MRI scans**  
 lower GI, Geriatric 1:10  
 pediatric, 22:266-267  
**Multifocal atrial tachycardia (MAT)**, 4:43, 43f, 47t  
**Muscle relaxants**, 11:150  
**Muscles**, intrinsic hand, 23:277  
**Mustard (HD)**, 2S:3  
**Mycoplasma**  
 antimicrobial therapy for, 9:119, 120  
 in PID, 1:9  
***Mycoplasma pneumoniae***  
 in CAP, 10:136, 138, 139t  
 combination therapy for, 9:123, 10:132  
 empiric antibiotic coverage for, 10:136  
 outpatient management of, 10:130, 131  
**Myocardial decompensation**, acute, 7:81-91  
**Myocardial infarction**, 19:227, 228t  
**Myocardial injury**, 7:84-85  
**Myxedema coma**, Geriatric 2:3  
 clinical features of, Geriatric 2:4, 4t  
 precipitating events for, Geriatric 2:3-4, 4t  
 treatment of, Geriatric 2:4-5, 5t

## N

**Nabumetone**, 5:57-58  
 for pain management, 5:57t  
**Nalbuphine**, 5:61t  
**Nalmefene**, 21:257  
**Naloxone (Narcan)**, 21:257  
 cost of, 21:258t  
 for reversal of adult sedation, 21:254t  
 or reversal of pediatric sedation, 21:256t  
**Naltrexone**, 21:257  
**Naprosyn**, 5:58  
**Naproxen**, 5:58  
**Narcan**. See Naloxone  
**National Committee on Clinical Laboratory Standards (NCCLS) year 2002 breakpoints**, 9:118-119  
 outcome-effective strategies based on, 10:129-142  
**Natriuretic peptides**  
 in AF, 18:214  
 B-type, 7:89-90  
**Nausea and vomiting**, medication-induced, 5:59  
**NCCLS**. See National Committee on Clinical Laboratory Standards  
**Necrotizing fasciitis**, 25:306-307  
***Neisseria gonorrhoeae***  
 in acute epididymitis, 2:24  
 prophylaxis of, 6:77t  
 treatment of, 1:10t, 6:77t  
 in urethritis, 3:37  
***Neisseria meningitidis***, 10:138  
**Nelfinavir**, 538Z:6t  
**Nerve agents**, 2S:3  
**Nerves**, hand, 23:278-279  
**Nesiritide**, 8:100-101, 100t, 101t  
**Neurogenic AF**, 19:227  
**Neuroleptic agents**, 21:258  
**Neurological evaluation**, of acute hand, 23:281-282  
**Neuroophthalmology**, 13:174-175  
**Neurovascular injuries**, to hand, 24:295-296  
**New Hampshire**, 535Z:5t  
**New Mexico**, 535Z:5t  
**New York Heart Association class**, 7:88t  
**Nitrate therapy**, 8:101t  
**Nitrofurantoin (Macrobid)**, 1:10-11  
**Nitroglycerin (NTG)**  
 for acute pulmonary edema, 8:95  
 for heart failure, 8:100, 100t  
 with lower GI bleeding, Geriatric 1:10  
**Nitroprusside**, 8:100, 100t  
**Nitrous oxide**, 21:249-250  
**Non-steroidal anti-inflammatory drugs (NSAIDs)**  
 contraindications to, 8:104-105  
 drug interactions, 12:155  
 for ectopic pregnancy, 1:5  
 for pain management, 5:55-58, 56t-57t  
 for uterine fibroids, 1:13  
 warfarin interactions, 12:154, 155t  
**Normeperidine**, 5:61  
**Novocaine**. See Procaine  
**NPO status**, for children, 22:263-264, 264t  
**NSAIDs**. See Non-steroidal anti-inflammatory drugs  
**NTG**. See Nitroglycerin  
**Nursing homes**, CAP in, 9:112t  
**Nursing issues in VTE prophylaxis**, 16:199-200

## O

**Obesity**, 15:184  
**Occupational percutaneous exposure to HIV**, 538Z:2  
**Octylcyanoacrylate (Dermabond, Ethicon)**, 26:321  
**Ocular burns/chemical exposure**, 13:168-169, 170t  
**Ocular manifestations of systemic disease**, 13:175  
**Ofloxacin**  
 for acute bacterial prostatitis, 3:35  
 for acute epididymitis, 2:24  
 for gonorrhea, 1:10t, 6:77t  
 ophthalmic solution, 13:168t  
 for pyelonephritis, 1:11  
**Ondansetron**, 5:59  
**Ophthalmic antibiotics**, 13:168t  
**Ophthalmologic emergencies**, 13:163-175  
**Ophthalmologists**, 13:175  
**Ophthalmoplegia**, internuclear, 13:175  
**Opioids**  
 analgesics, 17:208  
 antagonists, 21:257  
 for pain management, 5:58-62  
 for procedural sedation, 21:252-257  
 short-acting, 21:257  
 starting doses, 5:61t  
**Optic nerve trauma**, 13:170  
**Optic neuritis**, 13:175  
**Oragrafin**. See Ipratropium  
**Oral contraceptives**, 1:13  
**Orbital cellulitis**, 13:173  
**Orbital compartment syndrome**, 13:170  
**Orchitis**, 2:25  
**Orphenadrine**, 5:62t  
**Orthopedic injury**, missed, 536Z:6-7  
**Osteoporosis**, heparin-induced, 15:184  
**Outpatient therapy**  
 anticoagulation, 8:104  
 for CAP, 9:113t, 114t, 115-116, 10:140t  
 ASCAP consensus panel recommendations for, 10:130-131  
 guidelines for, 10:137t, 139t  
 for DVT, 15:179-181  
 minimal criteria for, 15:182  
 minimal criteria for early discharge, 15:183t  
 pharmacoeconomic considerations for, 15:180  
 for venous thromboembolism, 15:178-179  
**Ovarian cysts**, 1:12  
**Ovarian torsion**, 1:5, 6, 6f  
**Over-the-counter (OTC) medications**, for pain management, 5:56t-57t  
**Oxaprozin**, 5:56t, 58  
**Oxycodone**, 5:61, 61t  
**Oxymorphone**, 5:61t, 62  
**Oxyphenbutazone**, 5:58

# P

## Pain

abdominal

high-risk patients, 536Z:6

right lower quadrant, in women, 1:1-13

acute, 5:64

associated with sources of GI bleeding, Geriatric 1:7t

chest, high-risk patients, 536Z:5-6

chronic, 5:64-65

definition and assessment of, 5:54

## Pain management, 5:53-66

adjuvants, 5:62

in children, 5:65

in elderly, 5:65-66

general principles of, 5:65t

NSAIDs for, 5:55, 56t-57t

over-the-counter medications for, 5:56t-57t

relief of pain and suffering, 537Z:8-9

special considerations, 5:64-66

## Pain pathway, 5:54-64

## Paraphimosis, 3:32-33, 33f

## Parents

inappropriate care requests, 537Z:6

permission, 537Z:4

refusal of treatment, overriding, 537Z:5-6

## Parkinson's disease, 20:242

## Paronychia

acute, 25:304

technique for, 25:304, 306f

## Paroxetine, 12:155

## Pasteurella multocida, 25:309, 26:324, 325

## Patient education

for anticoagulation therapy, 15:180-181

about intimate partner violence, 535Z:4

polypharmacy self-education, 12:156-157

## Pediatric patients

advance directives, 537Z:5

drugs and reversal agents for sedation and analgesia in, 21:255t-266t

ethical issues, 537Z:1-9

hand problems in, 25:308-309

informed consent with, 537Z:3-4

initial trauma management in, Trauma 3:10

sedation of, 22:266-267

sexual abuse of, 6:69-76

definition of the problem, 6:70

evidence collection in, 6:74-75

history and interview, 6:71

legal issues and reporting, 6:76

physical examination findings and classification of, 6:74, 75t

presentation of, 6:70-71

terminology and anatomy of, 6:73-74

## Pelvic fractures, adult, Trauma 4:1-10

classification of, Trauma 4:5-6

diagnostic adjuncts, Trauma 4:4

epidemiology of, Trauma 4:1

history, Trauma 4:3-4

physical exam with, Trauma 4:4

radiologic evaluation of, Trauma 4:4-5

resulting in ring disruption, Trauma 4:6-8

single bone and avulsion injuries, Trauma 4:8-9

Tile classification of, Trauma 4:5, 5t

transfer of patients with, Trauma 4:8

Young classification of, Trauma 4:6, 6t, 7f

## Pelvic inflammatory disease, 1:9-10

diagnostic criteria for, 1:9t

outpatient treatment of, 1:9, 10t

## Pelvis, Trauma 4:2-3

## Penicillin

for CAP, 9:119

for conjunctivitis, 13:171

## Penile cancer, 3:34

## Penile disorders, 3:29-34

## Penile fracture, 3:34

## Penile tourniquet, 3:33

## Penis, 3:31f

## Pennsylvania, 535Z:5t

## Pentazocine, 5:62

## Pentobarbital (Nembutal)

cost of, 21:258t

for pediatric sedation and analgesia, 21:256t, 22:266-267

## Peptostreptococcus, 1:9

## Periorbital (preseptal)/orbital cellulitis, 13:173

## Pharmacodynamics, 11:149-150

## Pharmacoeconomics

in outpatient therapy for DVT, 15:180

in VTE prophylaxis, 16:199

## Pharmacological cardioversion, 19:222-223, 224

## Pharmacologically augmented electrical cardioversion, 19:224

## Phenazopyridine, 1:11

## Phenelzine, 12:155

## Phenergan. See Chlorpromazine

## Phenylbutazone, 5:58

## Phenylephrine, 3:30

## Phenytoin, 5:63

## Pheochromocytoma, 20:241

## Phimosis, 3:31-32

dorsal slit procedure for, 3:32, 32f

paraphimosis, 3:32-33

## Phosgene (CG), 2S:3

## Physical status, 21:249, 250t

## Physiology, 11:148

## Pinguecula/pterygium, 13:170

## Piperacillin

for acute cholangitis, 17:208t

for CAP, 9:113t, 10:139t

## Piperacillin-tazobactam, 9:113t, 10:139t

## PIP joint dislocations, 24:291, 291f

## Piroxicam, 5:57t, 58

## Plain abdominal films, Geriatric 1:10

## Planning for bioterrorism, 12S:4

## Plasma, Trauma 3:7

## Platelets, Trauma 3:7

## Pneumonia, community-acquired (CAP)

antibiotic therapy for

consensus guidelines for, 10:138-139

empiric, 10:136-138

selection for hospitalized patients, 9:116-117, 10:129-142

antimicrobial therapy for, 9:119-120, 10:129-142

empiric, 9:112t, 113t, 10:137t

guidelines for, 9:112t, 113t, 10:139t

ASCCAP 2002 Consensus Report Panel and Scientific Roundtable, 9:111

ASCCAP 2002 guidelines, 9:112t

combination therapy for, 9:123, 10:131-133

critical pathways and protocols for, 10:132

diagnosis of, 9:111-115

empiric therapy for, 9:114t, 10:140t

epidemiology of, 9:111-115

evaluation of, 9:111-115

in-hospital management of, 9:109-122, 10:131-133, 137t, 139t

initial stabilization and adjunctive measures for, 9:113-115

outcome-effective strategies for, 9:109-122

outcome-optimizing regimens for, 9:121-122

outpatient management of, 9:115-116, 10:130-131

ASCCAP consensus panel recommendations for, 10:130-131

guidelines for, 10:137t, 139t

pathogens in, 10:138

patient disposition in, 9:115

patient management recommendations, 10:130-131

prevention of DVT in, 10:139-142

prognostic scoring for, 9:115-116

signs and symptoms of, 9:113

treatment guidelines for, 9:120-121

## Podofilox, 6:77t

## Podophyllin, 6:77t

## Polypharmacy

in elderly, 11:145-150, 12:153-159

etiology of, 11:147

high-risk drugs, 12:153-155, 155t

legal considerations for, 12:156

scope of the problem, 11:146-147

self-education, 12:156-157

strategies to prevent ADEs, 12:157t

vulnerability of elderly to, 11:147-148

## Polyps, colonic, Geriatric 1:9

## Porphyria, acute intermittent, 20:242

## Portable CXR, 7:91t

## Potassium iodide, saturated solution of (SSKI)

for thyroid storm, Geriatric 2:9, 9t

for thyrotoxicosis, 19:227

## Prazosin, 12:156t

## Pregnancy, ectopic, 1:4-5

delayed or missed diagnosis of, 1:5t

risk factors for, 1:4t

## Preseptal/orbital cellulitis, 13:173

**Priapism**, 3:29-31  
**Prilocaine**, 22:267, 268t  
**PRIME study group**, 16:197-199, S02101:5-6  
**PRINCE study**, 16:197, S02101:5  
**Procainamide**  
for cardioversion, 19:222, 223, 223t, 225  
for post-surgical AF, 19:227, 228t  
for rate control in AF, 19:220, 222t  
for SVT, 4S  
for WPW syndrome, 19:227, 228t  
**Procaine (Novocaine)**, 26:318t  
**Procaine with epinephrine**, 26:318t  
**Prochlorperazine**, 5:59  
**Proctitis**, radiation, Geriatric 1:9  
**Promethazine (Thorazine)**, 17:208, 21:249  
**Prone knee-chest position**, 6:72, 74f  
**Propafenone**  
for cardioversion, 19:222, 223, 223t, 225  
for exercise-induced AF, 19:227-228, 228t  
for left ventricular hypertrophy, 19:227, 228t  
for rate control, 19:220  
for sinus rhythm maintenance, 19:226  
**Propofol (Diprivan)**  
for adult sedation and analgesia, 21:254t  
cost of, 21:258t  
for procedural sedation, 21:251  
for sedation of ventilated patients, 22:266  
**Propoxyphene**, 5:61-62  
**Propranolol**, Geriatric 2:9, 9t  
**Propylthiouracil**  
for thyroid storm, Geriatric 2:9, 9t  
for thyrotoxicosis, 19:227  
**Prostate**, 3:34-35  
**Prostate cancer**, 3:35  
**Prostatitis**, 3:34-35  
**Proteus**  
monotherapy vs. combination therapy for, 10:132  
in prostatitis, 3:35  
in UTI and pyelonephritis, 1:10  
**Proximal and middle phalanx fractures**, 24:288-289, 289t  
**Pseudoephedrine**, 3:30  
**Pseudomonas**  
in acute epididymitis, 2:24  
antibiotic coverage for, 10:136  
antimicrobial therapy for, 9:119, 120, 10:137t  
in gallbladder disease, 17:207  
monotherapy vs. combination therapy for, 10:132  
in prostatitis, 3:35  
in UTI and pyelonephritis, 1:10  
**Pseudotumor cerebri**, 13:175  
**Psychiatric complaints**  
incorrect assumptions and pitfalls, 20:234-235, 235t  
medical conditions presenting with, 20:242-243, 242t  
organic and medical mimics, 20:233-234, 236-238  
ABC mnemonic for, 20:236-238, 237t  
clues to help differentiate, 20:235, 236t

**Pterygium**, 13:170  
**Pubic hair**, 6:73t  
**Publication resources**, 12:157t  
**Pulmonary agents**, 2S:3  
**Pulmonary angiography**, 14:170  
**Pulmonary aspiration**, 21:258-259, 259t  
**Pulmonary edema**, acute, 7:85-86, 8:105  
diagnosis of, 7:85-86, 87t  
initial therapy for, 8:95, 95t  
management strategies for, 8:95  
**Pulmonary embolectomy**, 15:186  
**Pulmonary embolism**  
D-dimer test for, 14:170f, 171  
diagnosis of, 14:171, 14S  
differential diagnosis of, 14:166t, 167  
pre-test probability for, 14:167, 167t  
prevention of, S02101:1-7  
treatment of, 15:175-186  
**Puncture wounds**, 26:316  
**Pyelonephritis**, 1:10-11

## Q

**Qualification of experts**, 536Z:3-4  
**Quality assurance**, 22:270-271, 271f  
**Quality improvement**, 21:258-259  
**Quinidine**  
for cardioversion, 19:222, 223t, 225  
CCB interactions, 12:156t  
digoxin interactions, 12:155  
for neurogenic AF, 19:227, 228t  
**Quinolones**, 9:112t, 119, 10:136

## R

**Rabies immune globulin (RIG)**, 26:325  
**Rabies prophylaxis**, 26:325, 325t  
**RADAR screening**, 535Z:3  
**Radiation proctitis**, Geriatric 1:9  
**Radiofrequency catheter ablation, endocardial**, 19:228  
**Radiography**  
chest (CXR)  
in heart failure, 7:90, 91t  
portable, 7:91t  
in venous thromboembolism, 14:167-168  
cleaning, 23:282-283  
of hand, 23:282-283  
in heart failure, 7:90-91  
of pelvic fracture, Trauma 4:4-5  
plain abdominal films, Geriatric 1:10  
**Ramipril**, 8:96t  
**Ramsey Sedation Scale**, 21:258-259, 258t. See also Modified Ramsay Score  
**Rapifenitnil**, 21:257  
**Rectal ulcers**, Geriatric 1:9  
**Red blood cells**, labeled, Geriatric 1:10  
**Red eye**, 13:171-173  
**Refusal of treatment**, parental, 537Z:5-6  
**Relief of pain and suffering**, 537Z:8-9

**Remifenitnil**, 21:257  
**Renal function**, 11:149  
**Renal insufficiency**, heparin-induced, 15:184  
**Reporting adverse drug events**, 12:159  
**Reporting intimate partner violence**, 535Z:4-5, 5t  
**Reporting pediatric sexual abuse**, 6:76  
**Requests for inappropriate care**, 537Z:6  
**Reserpine**, Geriatric 2:9, 9t  
**Resources**  
for drug information, 12:157t  
HIV-related, 538Z:7t  
**Respiratory failure**, S02101:3t  
**Resuscitation**, Trauma 3:2-5  
barrier precautions, Trauma 3:5  
endpoints of, Trauma 3:8-9  
horizontal, Trauma 3:3, 4f  
paradigms of, Trauma 3:3  
termination of efforts, 537Z:8  
**Resuscitation fluid**, Trauma 3:6-8  
**Resuscitation physicians**, Trauma 3:2-3  
**Retinal detachments**, 13:173  
**Retinitis**, CMV, 13:175  
**Retinopathy**  
diabetic, 13:175  
hypertensive, 13:175  
**Retrobulbar hemorrhage**, 13:170  
**Rhode Island**, 535Z:5t  
**RIG**. See Rabies immune globulin  
**Right lower quadrant abdominal pain**, in women  
algorithmic approach to, 1:1-13  
differential diagnosis of, 1:2t, 3f, 4-13  
**Rights**, children's, 537Z:1-9  
**Ring disruption**, pelvic fractures resulting in, Trauma 4:6-8  
**Rofecoxib**, 5:57t, 58  
**Rolando's fractures**, 24:289t  
**RU-486**, 1:13

## S

**Sacroiliac complex**  
anatomy of, Trauma 4:2-3  
mechanical design of, Trauma 4:2-3, 3f  
posterior view of, Trauma 4:2f  
sagittal view, Trauma 4:3  
**Salicylates**, 12:155t  
**Saline**, hypertonic, Trauma 3:8  
**Saline**, swab, and Foley catheter techniques for sexual abuse examination, 6:72  
**Sarin (GB)**, 2S:3  
**Scleritis**, 13:172  
**Scopolamine**  
drug interactions, 11:150  
for pain management, 5:59  
**Screening**  
for domestic violence, 535Z:3  
for VTE, 16:192-193  
**Scrotal disorders**, 2:19-20  
**Scrotum**  
acute, 2:19-20, 19t

|  |  |   |
|--|--|---|
| <p>anatomy of, 2:19, 19f</p> <p>intracrotal appendages, 2:24-25, 24f</p> <p>trauma to, 2:26</p> <p><b>Sedation</b></p> <p>adult, drugs and reversal agents for, 21:253t-255t</p> <p>adverse events, 22:269t, 270-271</p> <p>agents for, 21:248-249, 249-258</p> <p>complications of, 22:270-271</p> <p>conscious</p> <ul style="list-style-type: none"> <li>definition of, 21:248</li> <li>sample discharge instructions form, 22:270f</li> </ul> <p>deep, 21:248</p> <p>dissociative, 21:248</p> <p>exclusions, 21:249, 251t</p> <p>fasting recommendations to reduce risk of pulmonary aspiration, 21:258-259, 259t</p> <p>levels of, 21:248, 249t</p> <p>monitoring, 22:265-266</p> <p>for non-painful conditions, 22:266-267</p> <p>patient assessment for, 21:248, 248t</p> <p>patient selection for, 22:263-264</p> <p>pediatric, 22:266</p> <ul style="list-style-type: none"> <li>for CT and MRI scans, 22:266-267</li> <li>drugs and reversal agents for, 21:255t-266t</li> </ul> <p>post-procedure care, 22:269</p> <p>post-sedation and analgesia discharge criteria, 22:269, 269t</p> <p>preparation for, 22:264-265, 265t</p> <p>pre-sedation assessment, 22:264-265</p> <p>procedural, 21:247-259, 22:263-271</p> <p>quality assurance, 22:270-271, 271f</p> <p>quality improvement and monitoring, 21:258-259</p> <p>Ramsey Scale, 21:258-259, 258t</p> <p>reversal agents, 21:257</p> <p>topical agents for, 22:267-269</p> <p>unconscious, 21:248</p> <p>for ventilated patients, 22:266</p> <p>for wound management, 26:318-319</p> <p><b>Sedatives</b>, 21:249-258</p> <ul style="list-style-type: none"> <li>classification of, 21:248-249</li> <li>combination of, 21:257</li> <li>cost of, 21:258t</li> <li>definition of, 21:248</li> </ul> <p><b>Selective serotonin-reuptake inhibitors</b></p> <ul style="list-style-type: none"> <li>for pain management, 5:63</li> <li>serotonergic drug interactions, 12:155</li> </ul> <p><b>Self-education</b>, 12:156-157</p> <p><b>Sensation</b>, in hand, 23:281-282</p> <p><b>Septic arthritis</b>, 25:305-306</p> <p><b>Serotonergic drugs</b>, 12:155</p> <p><b>Serratia</b>, 3:35</p> <p><b>Sertraline</b>, 12:155</p> <p><b>Sexual abuse</b></p> <ul style="list-style-type: none"> <li>behavioral indicators of, 6:70, 72t</li> <li>complaint/exam indicators of, 6:70, 72t</li> <li>differential diagnosis of, 6:75-76</li> <li>examination of, 6:71</li> <li>interview questions, 6:71, 73t</li> </ul> | <p>pediatric, 6:69-76</p> <p>physical examination findings and classification of, 6:74, 75t</p> <p>physical examination techniques for, 6:72</p> <p>specialized forensic exam techniques, 6:72-73</p> <p><b>Sexually transmitted diseases</b></p> <ul style="list-style-type: none"> <li>prophylaxis of, 6:75, 77t</li> <li>testing for, 6:75</li> <li>treatment of, 6:77t</li> </ul> <p><b>Shock</b></p> <ul style="list-style-type: none"> <li>cardiogenic, 7:85, 8:105</li> <li>diagnosis of, 7:85</li> <li>diagnostic criteria for, 7:85t</li> <li>etiologies of, 7:84, 84t</li> <li>management strategies for, 8:95</li> <li>physiology of, Trauma 3:5-6</li> </ul> <p><b>Sigmoidoscopy</b>, Geriatric 1:10</p> <p><b>Sinus node reentrant tachycardia</b>, 4:43, 47t</p> <p><b>Sinus rhythm maintenance</b>, 19:225-226</p> <p><b>Sinus tachycardia</b>, 4:42-43, 43f, 47t</p> <p><b>Skeletal muscle relaxants</b>, 5:62, 62t</p> <p><b>Skin-closure tapes</b>, 26:322</p> <p><b>Small bowel vascular anomalies</b>, Geriatric 1:10</p> <p><b>Small intestinal ulceration</b>, Geriatric 1:10</p> <p><b>Smallpox infection control</b>, 12S:3-4</p> <p><b>Sodium sulfacetamide ointment</b>, 13:168t</p> <p><b>Sodium sulfacetamide solution</b>, 13:168t</p> <p><b>Software resources</b>, 12:157t</p> <p><b>Soman</b>, 2S:3</p> <p><b>SOS (Sick, Old, Surgery) DVT QuickSCREEN®</b>, 16:193</p> <p><b>Sotalol</b></p> <ul style="list-style-type: none"> <li>for brady-tachy syndrome, 19:227, 228t</li> <li>for cardioversion, 19:222, 223t, 225</li> <li>for exercise-induced AF, 19:227-228, 228t</li> <li>for ischemic heart disease/MI, 19:227, 228t</li> <li>for rate control in AF, 19:220, 222t</li> <li>for sinus rhythm maintenance, 19:226</li> </ul> <p><b>Spectinomycin</b>, 6:77t</p> <p><b>Spinal cord injury</b>, Trauma 3:9</p> <p><b>Spironolactone</b>, 8:99-100</p> <p><b>Staff communication</b>, 12:158</p> <p><b>Stanford (CA) Hospital and Clinics (SHC) &amp; Lucile Packard Children's Hospital (LPCH)</b>, 12S:4</p> <p><b>Staphylococcus</b></p> <ul style="list-style-type: none"> <li>in acute paronychia, 25:304</li> <li>in animal bites, 25:309</li> <li>in cholecystitis/cholangitis, 17:205, 205t</li> <li>in conjunctivitis, 13:171</li> </ul> <p><b>Staphylococcus aureus</b></p> <ul style="list-style-type: none"> <li>in CAP, 10:138</li> <li>combination therapy for, 9:123, 10:132</li> <li>empiric antimicrobial therapy for, 10:137t</li> <li>in fight bites, 25:309</li> <li>methicillin-resistant (MRSA), 10:135</li> </ul> <p><b>Staphylococcus saprophyticus</b>, 1:10</p> <p><b>Staples</b>, 26:321-322</p> <p><b>Statutes of limitation</b>, 536Z:3</p> <p><b>Stavudine</b>, 538Z:6t</p> | <p><b>St. John's wort</b>, 12:155</p> <p><b>Streptococcus</b></p> <ul style="list-style-type: none"> <li>in animal bites, 25:309</li> <li>in cholecystitis/cholangitis, 17:205, 205t</li> <li>in conjunctivitis, 13:171</li> </ul> <p><b>Streptococcus faecalis</b>, 3:35</p> <p><b>Streptococcus pneumoniae</b></p> <ul style="list-style-type: none"> <li>antibiotic therapy for, 10:136</li> <li>antimicrobial therapy for, 9:119, 120, 10:137t</li> <li>in CAP, 10:136, 138, 139t</li> <li>ceftriaxone vs. cefotaxime for, 9:122-123</li> <li>combination therapy for, 9:121-122, 123, 10:132</li> <li>fluoroquinolone resistance in, 9:117-118</li> <li>outpatient management of, 10:130, 131</li> <li>year 2002 NCCLS breakpoints, 9:118-119</li> </ul> <p><b>Streptococcus pyogenes</b>, 10:138</p> <p><b>Streptokinase</b>, 15:185, 185t</p> <p><b>Stress counseling</b>, 11S:1-4</p> <p><b>Stroke</b></p> <ul style="list-style-type: none"> <li>after AF, 18:213</li> <li>risk factors for, 19:224t</li> <li>source of, 18:216t</li> </ul> <p><b>Subconjunctival hemorrhage</b>, 13:167</p> <p><b>Sublimaze</b>. See Fentanyl</p> <p><b>Subluxation</b>, lens, 13:170</p> <p><b>Sudden death</b>, 8:105</p> <p><b>Sudden visual loss</b>, 13:173-174</p> <p><b>Sufentanil</b>, 21:257</p> <p><b>Suffering</b>, relief of, 537Z:8-9</p> <p><b>Sulbactam</b></p> <ul style="list-style-type: none"> <li>for acute cholangitis, 17:208t</li> <li>for CAP, 9:112t, 113t, 10:137t, 139t</li> </ul> <p><b>Sulfamethoxazole</b>. See Trimethoprim/sulfamethoxazole (Bactrim)</p> <p><b>Sulindac</b>, 5:57, 57t</p> <p><b>Supine frog leg position</b>, 6:72</p> <p><b>Supine knee-chest position</b>, 6:72</p> <p><b>Supportive services for patients</b>, 12:158</p> <p><b>Supraventricular tachycardia</b>, 4:41-50</p> <ul style="list-style-type: none"> <li>chronic management of, 4:50</li> <li>classification of, 4:42, 42t</li> <li>clinical presentation of, 4:42</li> <li>hemodynamically stable, 4:46-48</li> <li>hemodynamically unstable, 4:46</li> <li>incidence and prevalence of, 4:41-42</li> <li>management of, 4:46-50</li> <li>pathophysiology of, 4:42-46</li> <li>pharmacologic management of, 4:48-49, 4S</li> <li>summary, 4:47t</li> </ul> <p><b>Surgical treatment</b></p> <ul style="list-style-type: none"> <li>of paraphimosis, 3:32-33, 33f</li> <li>post-procedure care, 22:269</li> <li>post-surgical AF, 19:227, 228t</li> <li>pre-procedural airway examination, 22:264, 266t</li> <li>pre-procedural assessment, 22:267t</li> <li>pre-sedation assessment, 22:264-265</li> <li>procedural sedation, 21:247-259, 22:263-271</li> </ul> <p><b>Suture material</b>, 26:322t</p> <p><b>Sutures</b>, 26:321t, 322t</p> <p><b>Syphilis</b>, 6:77t</p> |
|--|--|---|

**T****T<sub>3</sub>**, Geriatric 2:1-2**T<sub>4</sub>**free, Geriatric 2:1  
total, Geriatric 2:1**Tabun (GA)**, 2S:3**Tachyarrhythmias**atrial, 4:42t  
atrioventricular, 4:42t**Tachycardia**, 4:42t**TAC (tetracaine/adrenaline/cocaine) solution or gel**, 22:267-269, 268t**Tanner staging**, 6:73t**Tazobactam**for acute cholangitis, 17:208t  
for CAP, 9:112t, 113t, 10:137t, 139t**TCA**. See Trichloroacetic acid**Telepaque**. See Iopanoic acid**Tendon injuries**care of, 24:292-293, 292t  
in hand, 24:292-295**Tenosynovitis**, flexor, 25:305**Terbutaline**, 3:30**Termination of resuscitation efforts**, 537Z:8**Terminology**of fractures, 24:289t  
of hand, 23:276**Testicular cancer**, 2:26**Testicular torsion**, 2:20-23, 21f  
differential diagnosis of, 2:20-26, 20t  
manual detorsion of, 2:23, 23f**Testis**anatomy of, 2:19, 19f  
appendix, torsion of, 2:24-25  
arterial signal to, 2:22, 22f  
bell-clapper testicle, 2:20-21, 21f**Tetanus**, 26:323, 324t**Tetanus-prone wounds**, 26:323t**Tetanus toxoid**, 26:323, 323t**Tetracaine (Amethocaine)**cream, 22:268t, 269  
LET solution or gel, 22:268t, 269  
TAC solution or gel, 22:267-269, 268t**Tetracycline**for CAP, 9:114t, 119, 10:140t  
for chlamydia prophylaxis, 6:77t  
digoxin interactions, 12:155**Thiazides**, 12:155**Thiopental**cost of, 21:258t  
for procedural sedation, 21:252**Thorazine**. See Promethazine**Thrombocytopenia**, heparin-induced, 15:183-184**Thromboembolism**burden of, 16:193-194, S02101:2-3  
prevention of, 19:226  
venous, 7:81-91, 14:163-171, 15:175-186epidemiology of, 16:192-193  
prophylaxis of, 16:191-200  
risk factors for, 16:193, 193t**Thrombolytic therapy**agents for, 15:185, 185t  
contraindications to, 15:185, 185t  
indications for, 15:185, 185t  
for VTE, 15:185**Thrombosis**calf vein, 15:186  
cavernous sinus, 13:174-175  
CLOT analysis, 16:199  
deep venous (DVT)  
diagnostic algorithm for, 14S  
differential diagnosis of, 14:166t, 167  
pre-test probability for, 14:167, 167t  
prophylaxis of, S02101:1-7**Thumb fractures**, 24:289t, 290**Thumb**, gamekeeper's, 24:292**Thyroid disease**, Geriatric 2:1-2**Thyroid-stimulating hormone**, Geriatric 2:1**Thyroid storm**, Geriatric 2:7-8diagnosis of, Geriatric 2:8  
diagnostic criteria for, Geriatric 2:8t  
laboratory diagnosis of, Geriatric 2:8-9  
precipitants of, Geriatric 2:8  
treatment of, Geriatric 2:9-10, 9t**Thyrototoxicosis**, 19:227, 228theart in, Geriatric 2:7  
signs and symptoms of, Geriatric 2:6**Ticarcillin/clavulanate**for acute cholangitis, 17:208t  
for CAP, 9:112t, 10:133, 137t  
daily cost, 9:117t**Ticarcillin/tazobactam**, 9:112t, 10:137t**Tissue adhesives**, 26:321contraindications to, 26:320t  
indications for, 26:319t  
pearls and pitfalls with, 26:320t**Tissue plasminogen activator (tPA)**, 15:185, 185t**Tizanidine**, 5:62**Tobramycin**for acute bacterial prostatitis, 3:35  
ophthalmic ointment, 13:168t  
ophthalmic solution, 13:168t**Tokyo**, Japan, 2S:2-4**Tolmetin**, 5:58**Topical anesthesia**, 22:267-269, 268t**Topical antibiotics**, 26:322**Tourniquet**, penile, 3:33**Tramadol**, 5:62**Transfusion triggers**, Trauma 3:7**Tranlycypromine**, 12:155**Trauma**in elderly, Trauma 3:9-10  
eye injuries, 13:166-170  
hand, 24:287-290  
hand amputations, 24:296-297  
initial management phase, Trauma 3:1-10  
optic nerve, 13:170in pediatric patients, Trauma 3:10  
scrotal/testicular, 2:26**Trauma Bay**, Trauma 3:2**Trauma resuscitation area**, Trauma 3:2, 3f, 4f**Trauma resuscitation team**, Trauma 3:3-4**Travel**, 14:166**Trazadone**, 12:155**Treatment regimens**, 12:158**Triage after chemical exposures**, 2S:2**Trichloroacetic acid (TCA)**, 6:77t**Trichomonas**, 6:77t**Tricyclic antidepressants (TCAs)**drug interactions, 11:150  
for pain management, 5:62-63**Trimethoprim/polymixin**ointment, 13:168t  
solution, 13:168t**Trimethoprim/sulfamethoxazole (Bactrim)**for acute bacterial prostatitis, 3:35  
for UTI, 1:10-11  
warfarin interactions, 12:154, 155t**Trovafoxacin**, 9:114t, 10:140t**Tunica vaginalis**, 2:20-21, 21f**U****UFH**. See Heparin, unfractionated**Ulcerative colitis**, Geriatric 1:9**Ulcers**rectal, Geriatric 1:9  
small intestinal, Geriatric 1:10**Ultrasound**Doppler, 2:22, 22f  
venous, 14:168**Unconscious sedation**, 21:248**Upper GI bleeding**acute, Geriatric 1:5f  
sites of, Geriatric 1:8**Ureaplasma**, 1:9**Urethral disorders**, 3:35-37**Urethral foreign bodies**, 3:37**Urethral meatus**, 6:74**Urethritis**, 3:37**Urinary retention, in male patients**, 3:35-36**Urinary tract infection, in women**, 1:10-11**Urokinase**, 15:185, 185t**Urologic emergencies, in male patients**, 2:17-26, 3  
:29-38**Urologic examination, male**, 2:18-19**Ursodiol**, 17:209**Uterine fibroids**, 1:13**Uveitis**, 13:172**V****Vagina**, 6:74**Vaginal vestibule**, 6:73**Vaginosis**, bacterial, 6:77t**Valacyclovir**, 6:77t**Valproic acid**, 5:63

**Valsartan**, 8:96t  
**Vancomycin**, 9:112t, 114t, 10:136, 137t, 140t  
**Variococele**, acute, 2:25  
**Vascular anomalies**  
gastric, Geriatric 1:10  
small bowel, Geriatric 1:9-10  
**Vasculitis**, Geriatric 1:9-10  
**Vasodilators**, 8:100, 100t, 102-105  
**Venography**, 14:169-170  
**Venous thromboembolism**, 7:81-91, 14:163-171, 15:175-186. See also Deep venous thrombosis; Pulmonary embolism  
anticoagulation therapy for, 15:181-183  
assessment of, 14:167, 170-171  
clinical evaluation of, 14:167-168  
D-dimer test for, 14:170f, 171  
diagnosis of, 14:167-168  
invasive studies for, 14:169-170  
pitfalls in, 14:171, 171t  
systematic approach to, 14:170-171  
tests for, 14:168-169  
epidemiology of, 16:192-193  
in medical patients, 14:165  
patient risk stratification for, 16:194-195  
pharmacologic strategies for, 16:192-193  
prophylaxis of, 8:93-105, 16:194-195, S02101:7  
enoxaparin vs. UFH, 16:199  
exclusionary criteria for, 16:193, 196f  
in hospitalized patients, 16:191-200, 193, 195f, 198f  
LMHW strategies for, 16:199-200  
nursing issues, 16:200  
pathway for, 16:198f  
pharmacoeconomic issues, 16:199  
risk factors for, 14:165-167, 165t, 16:193, 193t

screening for, 16:192-193  
thrombolytic therapy for, 15:185  
travel and, 14:166  
treatment of, 8:93-105, 15:178-179  
**Venous ultrasonography**, 14:168  
**Ventilation**, 22:266  
**Ventilation/perfusion (V/Q) scans**, 14:168-169  
**Ventricular arrhythmias**, 8:105  
**Ventricular rate control**, 19:220, 222t  
**Verapamil**  
CCB interactions, 12:155  
digoxin interactions, 12:155  
for rate control in AF, 19:220, 222t  
for SVT, 4:49, 4S  
**Versed**. See Midazolam  
**Violence, intimate partner**, 535Z:1-5  
**Visual acuity**, 13:163-164  
**Visual loss**  
gradual, 13:175  
sudden, 13:173-174  
**Vitreous hemorrhage**, 13:173  
**Volar plate**, 23:276, 277f, 24:290f  
**VX**, 2S:3

**Women**, right lower quadrant abdominal pain in  
algorithmic approach to, 1:1-13  
differential diagnosis of, 1:2t, 3f, 4-13  
**Wound closure**  
methods of, 26:321-322  
secondary or delayed primary, 26:319t  
timing of, 26:320  
**Wound irrigation**, 26:319-320  
**Wound management**, 26:315-328  
dressings, 26:322-323  
evaluation, 26:316-317  
post-repair care, 26:322-323  
prophylactic antibiotics for, 26:323-324  
tetanus prophylaxis, 26:324t  
**Wound preparation**, 26:319  
**Wounds**  
animal bite, with increased risk for infection, 26:325t  
combination, 26:316  
crush, 26:316  
epidemiology of, 26:315-316  
puncture, 26:316  
tetanus-prone, 26:323t

## W

**Warfarin**  
for AF, 19:222, 226, 226t  
drug interactions, 12:153-154, 155t  
for DVT, 15:180-181  
for VTE, 15:183  
**Wilson's disease**, 20:242  
**Wolff-Parkinson-White (WPW) syndrome**, 4:46, 49-50, 19:226-227, 228t

## X

**X-rays**. See Radiography  
**Xylocaine**. See Lidocaine

## Z

**Zebras**, Geriatric 1:9-10  
**Zidovudine (AZT)**, 6:77t, 538Z:6t  
**Zipper injuries**, 3:33

### FINANCIAL DISCLOSURE STATEMENT

In order to reveal any potential bias in this publication, and in accordance with Accreditation Council for Continuing Medical Education guidelines, we present the following annual statement of disclosure of the editorial board members of *Emergency Medicine Reports*.

**Paul S. Auerbach, MD; Brooks F. Bock, MD; Kenneth H. Butler, DO; Michael L. Coates, MD; Alasdair K.T. Conn, MD; David A. Kramer, MD; Larry B. Mellick, MD; Paul E. Pepe, MD; Robert Powers, MD; Barry H. Rumack, MD; David Sklar, MD; J. Stephan Stapczynski, MD; Steven M. Winograd, MD; and Allan B. Wolfson, MD**, report no relationships with companies related to the field of study covered by this CME program.

**Charles L. Emerman, MD**

Consultant: Scios, Aventis  
Speaker's bureau: Scios, Pfizer, Roche, Aventis, and Sepracor.  
Research: Scios, Aventis, Abbott

**Kurt Kleinschmidt, MD**

Speaker's bureau: Aventis.

**Charles V. Pollack Jr., MD**

Consultant: Aventis, Schering-Plough, Millennium, Ischemia Technologies  
Speaker's bureau: Aventis, Schering-Plough,

Millennium, BMS, Sanofi  
Research: Aventis

**David J. Robinson, MD**

Consultant: Centocor  
Speaker's bureau: Centocor, Aventis

**Steven G. Rothrock, MD**

Stockholder: Gilead Sciences, Medtronic, Pfizer, Merck, Johnson/Johnson.

**Sandra M. Schneider, MD**

Stockholder: Roche

**Corey M. Slovis, MD**

Speaker's bureau, consultant: Merck, Cor-Key, Genentech, and Wyeth-Ayerst.

**David A. Talan, MD**

Consultant: Bayer  
Speaker's bureau: Pfizer, Bayer, and Ortho-McNeil  
Research: Bayer, OrthoMcNeil, Pfizer, Lilly, BMS, Astra-Zeneca

Research: Bristol-Myers, Bayer, and Eli Lilly.

**Albert C. Weihl, MD**

Consultant: Fugisawa Pharmaceuticals

**Gideon Bosker, MD**, editor-in-chief, is on the speaker's bureau for Pfizer, Rhone-Poulenc Rorer, and Parke-Davis. Dr. Bosker also acknowledges that he receives royalties, commissions, and other compensation relating to the sale of textbooks, reprints of articles, and other written materials to the following pharmaceutical companies: Pfizer, Genentech, Aventis, Pharmacia, and Bayer.

**William Brady, MD, Frederic H. Kauffman, MD, John A. Schriver, MD, Richard Saluzzo, MD, and Charles E. Stewart, MD**, did not return disclosure forms.

## Emergency Medicine Reports 2002 titles

### JANUARY 1, 2002

Right Lower Quadrant Abdominal Pain in Women of Reproductive Age:  
An Algorithmic Approach

### JANUARY 14, 2002

Diagnosis and Emergency Department Management of Urologic  
Emergencies in the Male Patient. Part I: Scrotal Disorders

### JANUARY 28, 2002

Diagnosis and Emergency Department Management of Urologic  
Emergencies in the Male Patient. Part II: Penile Disorders

### FEBRUARY 11, 2002

Supraventricular Tachycardia (SVT): Strategies for Diagnosis, Risk  
Stratification, and Management in the Emergency Department Setting

### FEBRUARY 25, 2002

Pain Management in the Emergency Department

### MARCH 11, 2002

Evaluating Pediatric Sexual Abuse in the Emergency Department

### MARCH 25, 2002

The Clinical Challenge of Heart Failure: Comprehensive, Evidence-Based  
Management of the Hospitalized Patient With Acute Myocardial  
Decompensation—Diagnosis, Risk Stratification, and Outcome-  
Effective Treatment. Part I: Presentation, Differential Diagnosis,  
Laboratory Examination, and Prophylaxis Against Venous  
Thromboembolic Disease (VTED)

### APRIL 8, 2002

The Clinical Challenge of Heart Failure: Comprehensive, Evidence-Based  
Management of the Hospitalized Patient With Acute Myocardial  
Decompensation. Part II: Outcome-Effective Treatment and  
Prophylaxis Against Venous Thromboembolic Disease (VTED)

### APRIL 22, 2002

Community-Acquired Pneumonia (CAP) Antibiotic Selection and  
Management Update. Part I: Evaluation, Risk Stratification, and  
Current Antimicrobial Treatment Guidelines for Hospital-Based  
Management of CAP: Outcome-Effective Strategies Based on Year  
2002 NCCLS Breakpoints and Recent Clinical Studies

### MAY 6, 2002

Community-Acquired Pneumonia (CAP) Antibiotic Selection and  
Management Update. Part II: Evaluation, Risk Stratification, and  
Current Antimicrobial Treatment Guidelines for Hospital-Based  
Management of CAP: Outcome-Effective Strategies Based on New  
National Committee on Clinical Laboratory Standards (NCCLS)  
Breakpoints and Recent Clinical Studies

### MAY 20, 2002

Polypharmacy in the Elderly: Clinical Challenges in Emergency Practice.  
Part I: Overview, Etiology, and Drug Interactions

### JUNE 3, 2002

Polypharmacy in the Elderly: Clinical Challenges in Emergency Practice.  
Part II: High-Risk Drugs, Diagnosis, and the Role of the Emergency  
Physician

### JUNE 17, 2002

Common Ophthalmologic Emergencies: A Systematic Approach to  
Evaluation and Management

### JULY 1, 2002

The Current Challenge of Venous Thromboembolism (VTE) in the  
Hospitalized Patient: Optimizing Recognition, Evaluation, and  
Prophylaxis of At-Risk Patients. Part I: Patient Identification, Risk  
Factor Assessment, and Diagnostic Strategies

### JULY 15, 2002

Venous Thromboembolism (VTE) in the Hospitalized Patient. Part II:  
Treatment and Prevention of DVT and PE—Evolving Risk-  
Stratification and Prophylaxis Strategies for Emergency Medicine

### JULY 29, 2002

The Challenge of Preventing Venous Thromboembolism (VTE) in the  
Hospitalized Medical Patient. Part III: National Guidelines for DVT  
Prevention and Their Implications for Emergency Medicine Practice

### AUGUST 12, 2002

Presentation and Management of Acute Biliary Tract Disorders in the  
Emergency Department—Optimizing Assessment and Treatment of  
Cholelithiasis and Cholecystitis

### AUGUST 26, 2002

Atrial Fibrillation. Part I: Classification, Presentation, and Diagnostic  
Evaluation

### SEPTEMBER 9, 2002

Atrial Fibrillation. Part II: Management, Complications, and Disposition

### SEPTEMBER 23, 2002

Medical Conditions that Mimic Psychiatric Disease: A Systematic  
Approach for Evaluation of Patients Who Present with Psychiatric  
Symptomatology

### OCTOBER 7, 2002

Procedural Sedation: General Principles and Specific  
Pharmacotherapeutic Strategies—Part I

### OCTOBER 22, 2002

Procedural Sedation. Part II: Specific Scenarios, Topical Agents, and  
Establishment of Procedural Sedation Policy within the Emergency  
Department

### NOVEMBER 4, 2002

The Acute Hand: Assessment and Management in the ED Setting. Part I:  
Anatomy, Assessment, and Initial Management

### NOVEMBER 18, 2002

The Acute Hand: Assessment, Diagnosis, and Management in the ED  
Setting. Part II: Fractures and Neurovascular Injuries

### DECEMBER 2, 2002

The Acute Hand: Assessment and Management in the ED Setting. Part  
III: Management of Hand Infections and Deep Tissue Injuries

### DECEMBER 16, 2002

Update on Wound Management: Evidence-Based Strategies for  
Optimizing Outcomes