which in most cases is an exudate. Chest roentgenography, electrocardiography, and serum enzymes are of greatest value in diagnosing mimics of PE, such as myocardial infarction, acute pulmonary edema, and pneumothorax. For more conclusive endpoints, diagnostic studies are needed. If PE is suspected, a ventilation/perfusion lung scan should be the first diagnostic test to be performed. In a study of 515 patients with suspected PE and normal lung scans (3- to 6-month follow-up), only one case of fatal PE was reported.

A normal lung scan therefore predicts a benign eventual course for an embolic episode and rules out clinically significant PE. A high-probability lung scan will lead most physicians to immediately start either anticoagulant or thrombolytic therapy. An indeterminate lung scan indicates the need for pulmonary angiography. A low-probability lung scan has to be interpreted in light of clinical suspicion. In some cases, a normal noninvasive study of the leg veins (Doppler or impedance plethysmography) may justify withholding therapy, while in others pulmonary angiography may be needed.

Pulmonary angiography remains the gold standard for the diagnosis of PE, yet this procedure has failed to gain widespread use due to a need for broader availability of adequate facilities, the invasive nature of the procedure, and its potential hazards. In competent hands this procedure is safe, with morbidity less than 1% and mortality less than 0.01%. Selective arteriography significantly enhances the test's diagnostic sensitivity. Positive findings indicative of PE are distinct filling defects, cutoffs, and oligemia. Although the interpretation of results may vary widely, and although selective injection does not always produce enough detail at the bases, pulmonary angiography is the best technique at present to establish the diagnosis of PE.

MANAGEMENT

Apart from supportive measures, the management of PE consists of anticoagulation therapy with or without prior fibrinolytic therapy. The use of and indications for fibrinolytic therapy before anticoagulation therapy is still controversial. Whether fibrinolysis decreases the mortality or morbidity from PE is not yet known; however, fibrinolysis costs more and has more bleeding complications than heparin therapy. The data that support thrombolytic therapy show a more rapid resolution of thromboembolism in the pulmonary circulation, and a more thorough removal of emboli from the microcirculation than heparin. Each patient should be evaluated individually. In the absence of absolute contraindications and under expert supervision, thrombolytic therapy is reasonable in patients with massive PE, or in patients whose underlying status makes them more susceptible to hemodynamic derangement.

ON THE HORIZON

In the future, the management of PE would be facilitated with more sensitive, less invasive imaging techniques. In particular, digital subtraction angiography with higher resolution would offer improved demonstration of PE. Indium 111 platelet scintigraphy has exciting potential in the diagnosis and management of deep vein thrombosis, but its role in the diagnosis of PE needs further investigation. Also, initial trials of angioscopy for localizing chronic embolic obstructions has been promising. The angioscope of the future could permit biopsy, injection, or even suctioning to expand its diagnostic and therapeutic capabilities.

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SUGGESTED READING

Dalen JE, Haffajee CI, Alpert JS, et al. Pulmonary embolism, pulmonary hemorrhage, and pulmonary infarction. N Engl J Med 1977; **296:**1431–1435.

Hull RD, Raskob GE, Coates G, Panju AA. Clinical validity of a normal perfusion lung scan in patients with suspected pulmonary embolism. Chest 1990; **97:**23–26.

Novelline RA, Baltarowich OH, Athanasoulis CA, et al. The clinical course of patients with suspected pulmonary embolism and a negative pulmonary arteriogram. Radiology 1978; **126:**561–567.

The PIOPED investigators. Value of the ventilation/perfusion scan in acute pulmonary embolism. JAMA 1990; **263:**2753.

ORDERING STOOL EXAMS: ROOM FOR IMPROVEMENT

Hospitalized patients with diarrhea can be divided into two groups: (1) those who present with diarrhea on admission or develop it within the first 3 hospital days, and (2) those who develop diarrhea after the third hospital day. The diarrhea in the first group of patients can have an infectious or iatrogenic etiology, whereas diarrhea occurring after the third day is nosocomial and has an iatrogenic etiology. Only rarely is this nosocomial diarrhea infectious, as in the case of food poisoning in the institutional setting, or inadequate decontamination of diagnostic equipment.

The yields of stool cultures and ova and parasite (O & P) exams (percent of positive results per total number of specimens submitted) are traditionally lamentably low in hospitalized patients. This is particularly true for specimens from patients hospitalized for more than 3 days. For example, the Hospital of the University of Pennsylvania reported that over a 3-year period all of their positive stool cultures (except for one) and all of their O & P exams were submitted within the first 3 days of hospitalization. In contrast, *Clostridium difficile* toxin was positive throughout the hospital course.

Results of a retrospective 13-month study at the Cleveland Clinic showed that most positive cultures and O & P exams were those submitted within the first 3 days. Unfortunately, 62% of stool cultures and 52% of O & P exams were submitted after the third hospital day. In addition, although one stool culture is sensitive enough to detect bacterial pathogens, 29% of stool cultures were repeat cultures.

C *difficile* toxin can be positive at any time throughout the hospital course. Because stool cultures are usually negative after the third hospital day, C *difficile* toxin alone should be ordered initially in cases of diarrhea occurring later in the hospital course. We have not found the fecal leukocyte exam to be useful in the hospitalized patient.

RECOMMENDATIONS

Because diarrhea developing in the hospitalized patient after 3 days is nosocomial (and iatrogenic) rather than infectious in origin, we make the following three recommendations:

First, stool cultures and O & P exams should be requested only if the patient has a history of diarrhea on admission, develops diarrhea within 3 hospital days, or meets specific clinical conditions, such as a history of acquired immunodeficiency syndrome or intermittent diarrhea. In addition, cultures and O & P exams can be ordered for patients who continue to have diarrhea which developed before admission or within the first 3 hospital days but have not yet had a stool culture or O & P exam. One stool culture is sensitive enough to detect bacterial pathogens. Second, fecal leukocyte exams should not be performed, since they do not contribute significantly to the diagnosis of diarrhea in the hospitalized patient. And third, C *difficile* toxin alone should be ordered initially in most cases of diarrhea developing after the third hospital day.

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SUGGESTED READING

Guerrant RL, Shields DS, Thorson SM, Schorling JB. Evaluation and diagnosis of acute infectious diarrhea. Am J Med 1985; **78(Suppl 6b):**91.

Harris JC, DuPont HL, Hornick RB. Fecal leukocytes in diarrhea illness. Ann Intern Med 1972; **76:**697–703.

Koplan JP, Fineberg HV, Benfari Ferraro MJ, Rosenberg ML. Value of stool cultures. Lancet 1980; **2:**413–416.

Siegel DL, Edelstein PH, Nachamkin I. Inappropriate testing for diarrheal diseases in the hospital. JANA 1990; **263:**979–982.