more commonly in or adjacent to the proximal airways, and large at presentation, they are more often a cause of hemoptysis. These cancers can present with large-volume and life-threatening hemoptysis because of erosion into the hilar vessels. Carcinoid tumors, which are found almost exclusively as endobronchial lesions with friable mucosa, can also present with hemoptysis.

In addition to cancers arising in the lung, metastatic disease in the pulmonary parenchyma can bleed. Malignancies that commonly metastasize to the lungs include renal cell, breast, colon, testicular, and thyroid cancers as well as melanoma. While hemoptysis is not a common manifestation of pulmonary metastases, the combination of multiple pulmonary nodules and hemoptysis should raise suspicion of this etiology. Finally, disease of the pulmonary vasculature can cause hemoptysis. Perhaps most frequently, congestive heart failure with transmission of elevated left atrial pressures can lead to rupture of small alveolar capillaries. These patients rarely present with bright red blood but more commonly have pink, frothy sputum or blood-tinged secretions. Patients with a focal jet of mitral regurgitation can present with an upper-lobe opacity on chest radiography together with hemoptysis. This finding is thought to be due to focal increases in pulmonary capillary pressure due to the regurgitant jet. Pulmonary arteriovenous malformations are prone to bleeding. Pulmonary embolism can also lead to the development of hemoptysis, which is generally associated with pulmonary infarction. Pulmonary arterial hypertension from other causes rarely results in hemoptysis.

EVALUATION

As with most signs of possible illness, the initial step in the evaluation of hemoptysis is a thorough history and physical examination (Fig. 48-2). As already mentioned, initial questioning should focus on ascertaining whether the bleeding is truly from the respiratory tract and not the nasopharynx or gastrointestinal tract; bleeding from the latter sources requires different approaches to evaluation and treatment.

History and Physical Examination The specific characteristics of hemoptysis may be helpful in determining an etiology, such as whether the expectorated material consists of blood-tinged, purulent secretions; pink, frothy sputum; or pure blood. Information on specific triggers of the bleeding (e.g., recent inhalation exposures) as well as any previous episodes of hemoptysis should be elicited during history-taking. Monthly hemoptysis in a woman suggests catamenial hemoptysis from pulmonary endometriosis. Moreover, the volume of blood expectorated is important not only in determining the cause but also in gauging the urgency for further diagnostic and therapeutic maneuvers. Patients rarely exsanguinate from hemoptysis but can effectively "drown" in aspirated blood. Large-volume hemoptysis, referred to as *massive hemoptysis*, is variably defined as hemoptysis of >200–600 mL in 24 h. Massive hemoptysis should be considered a medical emergency. All patients should be asked about current or former cigarette smoking; this behavior predisposes to chronic bronchitis and increases the likelihood of bronchogenic cancer. Practitioners should inquire about symptoms and signs suggestive of respiratory tract infection (including fever, chills, and dyspnea), recent inhalation exposures, recent use of illicit substances, and risk factors for venous thromboembolism.

A medical history of malignancy or treatment thereof, rheumatologic disease, vascular disease, or underlying lung disease (e.g., bronchiectasis) may be relevant to the cause of hemoptysis. Because many causes of DAH can be part of a pulmonary-renal syndrome, specific inquiry into a history of renal insufficiency is important.

The physical examination begins with an assessment of vital signs and oxygen saturation to gauge whether there is evidence of life-threatening bleeding. Tachycardia, hypotension, and decreased oxygen saturation mandate a more expedited evaluation of hemoptysis. A specific focus on respiratory and cardiac examinations is important; these examinations should include inspection of the nares, auscultation of the lungs and heart, assessment of the lower extremities for symmetric or asymmetric edema, and evaluation for jugular venous distention. Clubbing of the digits may suggest underlying lung diseases such as bronchogenic carcinoma or bronchiectasis, which predispose to hemoptysis. Similarly, mucocutaneous telangiectasias should raise the specter of pulmonary arterial-venous malformations.

Diagnostic Evaluation For most patients, the next step in evaluation of hemoptysis should be a standard chest radiograph. If a source of bleeding is not identified on plain film, CT of the chest should be performed. CT allows better delineation of bronchiectasis, alveolar filling, cavitary

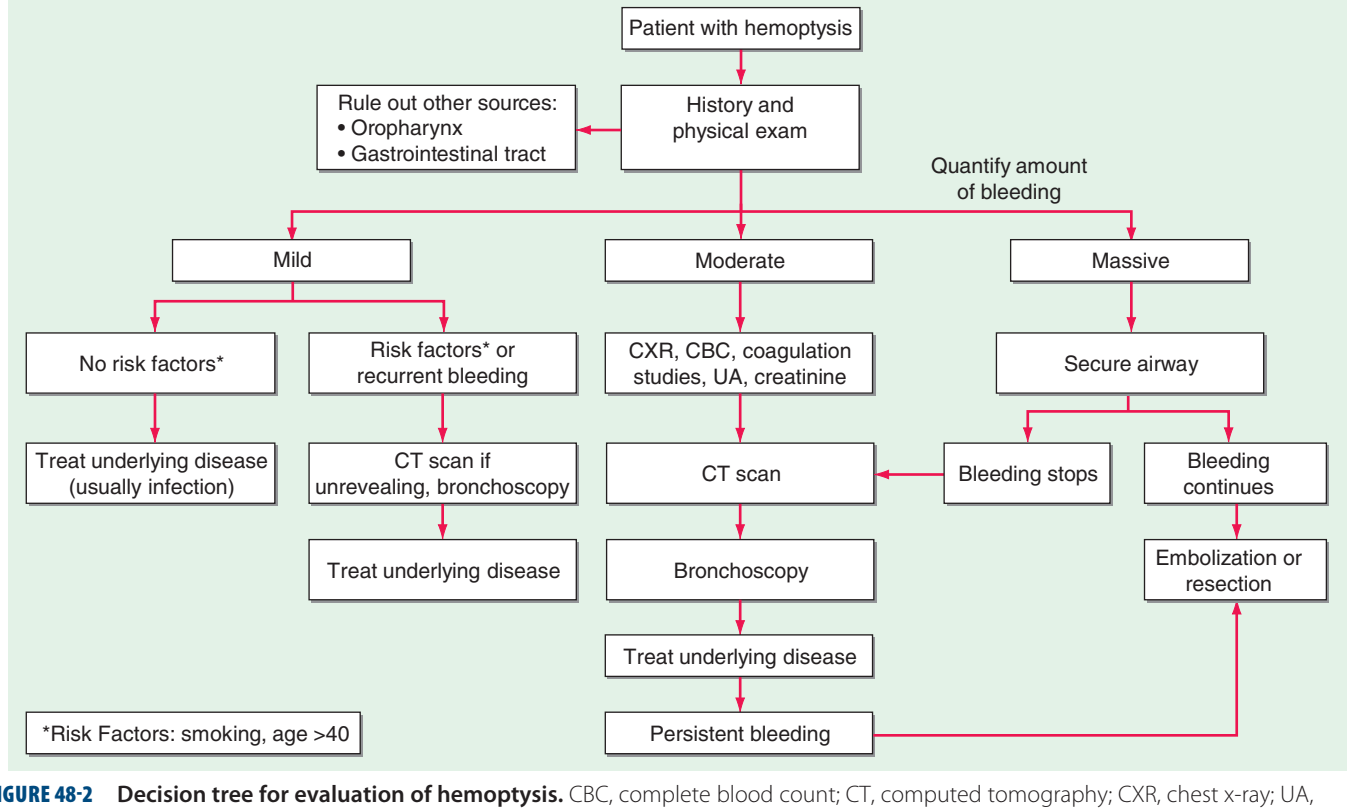

FIGURE 48-2 Decision tree for evaluation of hemoptysis. CBC, complete blood count; CT, computed tomography; CXR, chest x-ray; UA, urinalysis.