various means of diagnosing acute pulmonary embolism. More specifically, the goal of PIOPED is to determine the sensitivity and specificity of ventilation-perfusion lung scanning by using a specific set of diagnostic criteria.

Assigning Probability

After applying a set of diagnostic criteria to a lung scan, a determination of the probability or likelihood that pulmonary emboli are the cause of the observed ventilation-perfusion pattern is made. The categories of probability assigned are traditionally those of high, intermediate, or low probability. A *high probability* ventilation-perfusion pattern indicates a greater than 80% likelihood that pulmonary emboli are present, and a *low probability* pattern confers a less than 20% likelihood. Scans that are not deemed to be within the high or low categories are assigned an *intermediate probability*, which encompasses the wide range of likelihood between 20% and 80%. By using clinical and laboratory findings as well as pretest probability, some authors have suggested that interpreters assign a more specific percentage of probability within this range when possible. Reanalysis of the original PIOPED database has allowed the assignment of a *very low probability* to a lung scan indicating a less than 10% probability that pulmonary emboli are present. A lung scan with a very low probability interpretation has a similar diagnostic reliability as a high probability interpretation. A lung scan given a normal designation indicates a probability of pulmonary emboli approaching zero. Although the term *indeterminate* has been used synonymously with that of *intermediate* probability, the former term should ideally be reserved for studies in which an estimate of probability cannot be given because of technical limitations. When a combination of criteria is present on a single lung scan, the criterion producing the highest level of probability is that which should be assigned to the scan being interpreted.

PIOPED Interpretive Criteria

The PIOPED II criteria are perhaps the most widely used interpretive scheme for assigning a probability of pulmonary emboli to a ventilation-perfusion lung scan. The data from the PIOPED study are constantly being refined so that minor adjustments to the original set of criteria have been made. These PIOPED II criteria are given in Table 7–4. Another way of approaching the same data is given in Table 7–5. A thorough familiarity with

these criteria is crucial to the consistent and reliable interpretation of lung scans in the setting of suspected pulmonary embolism. To maintain a high specificity for the patterns described, especially high probability, some sensitivity is unavoidably lost.

It should be apparent from perusing the specific PIOPED II criteria in Table 7–4 that only the

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TABLE 7–4.   PIOPED II Criteria for Combined Ventilation-Perfusion Scan Interpretation

HIGH PROBABILITY

Two or more large mismatched segmental defects without a radiographic abnormality or the equivalent in moderate defects (two moderate defects equals one large defect)

INTERMEDIATE PROBABILITY

One moderate to less than two large segmented mismatched defects

Difficult to categorize as high or low

Solitary moderate or large segmental size triple match in lower lobe (zone)

LOW PROBABILITY

A single large or moderate matched ventilation-perfusion defect

More than three small segmental lesions

Absent perfusion in an entire lung

Solitary lobar mismatch

Moderate sized pleural effusion (greater than costophrenic angle but less than one-third of pleural cavity with no other perfusion defect in either lung

Heterogeneous perfusion

VERY LOW PROBABILITY

Nonsegmental lesion (e.g. prominent hilum, cardiomegaly, elevated hemidiaphragm, linear atelectasis, costophrenic angle effusion) with no other perfusion defect in either lung

Perfusion defect smaller than radiographic lesion

Two or more ventilation-perfusion matched defects with regionally normal chest x-ray and some areas of normal perfusion elsewhere in the lungs

One to three small segmental perfusion defects

A solitary triple matched defect in the mid or upper lung zone confined to a single segment

Stripe sign around the perfusion defect (best tangential view)

Pleural effusion of one-third or more of the pleural cavity with no other perfusion defect in either lung

NORMAL

No perfusion defects. Perfusion scan must outline the shape of the lungs seen on chest x-ray (which could be abnormal; e.g., scoliosis or pneumonectomy)