percent for less than 25 percent occlusion; 62.5 percent for 25 to 50 percent occlusion; and 37.5 percent for greater than 50 percent occlusion.

The consistency of these recalculation and the simplicity of the model coupled with Hatle and Rokseth's elegant demonstration that patients with myocardial infarction, left ventricular failure and pneumonia, chronic bronchitis and emphysema, and primary pulmonary hypertension can almost always be shown to have a "normal" arterial to end-tidal Pco₂ gradient on maximal expiration suggest that the end-tidal/arterial Pco₂ ratio could be a simpler test for the diagnosis of pulmonary embolism. In addition, the end-tidal/arterial Pco₂ ratio could be used to estimate the extent of the embolic problem as well as to monitor recovery from or to detect new emboli.

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Tuberculosis Case Finding

To the Editor:

Moulding and Sbarbaro in their recent editorial, "Case Finding to Prevent Tuberculosis: Is it Justified" (Chest 66:344-345, 1974), discuss some of the cost/benefit relationships in tuberculosis case findings and preventive therapy.

Exact data, however, give way to less exact material with the statement that free x-rays were offered at a stationary multiple use x-ray facility. As long as this free x-ray program continues to find a sufficient number of inactive cases who receive chemophylaxis (thereby producing a reasonable cost/benefit) it will be maintained.

It would be interesting to know just how many walk-in patients need to receive x-ray examination in order to find an inactive case under the new setup. Is it fewer than the 327 out of 103,371 found in the mobile-unit program? Is this judicious use of diagnostic x-ray examination?

In a statement signed by the Assistant Secretary of Health dated February 8, 1972 and endorsed by the American College of Radiology, by the American College of Chest Physicians, and by the US Public Health Service, the US Department of Health, Education, and Welfare suggested that routine screening x-ray examinations are "not productive as a screening procedure for detection of tuberculosis and should not be done." Even so, it would seem that most, if not all, of the inactive cases to be found in Denver (as anywhere else) would also have a reactive tuberculin test.

Would it not be more prudent in radiation dosage as well as cost/benefit analysis to give the much cheaper tuberculin test to all walk-in patients and then to administer x-ray examinations to the reactors. This would cut down the number of x-ray films by at least 80 percent and still pinpoint those who need diagnostic x-ray examination and later protection with preventive therapy. Some history taking at the time of tuberculin-test reading would also delineate others thought to be at high risk of developing tuberculous disease (diabetic patients, those taking immunosuppressive drugs, and young people).

The city of New York instituted such a program in 1972, closing all its walk-in x-ray screening units. The average reading rate of tuberculin tests is close to 90 percent with a consequent savings in x-ray dosage and operation costs, with the benefit of picking up inactives as well as other reactors who have nondiagnostic x-ray films but who would benefit from preventive therapy.

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To the Editor:

The major point raised by Dr. Reichman is that it might be better for health departments to give walk-in patients a screening tuberculin test rather than a chest x-ray examination. He quoted the statement by the US Department of Health, Education, and Welfare suggesting that routine screening x-ray films were not productive, etc. However, this statement referred to the indiscriminate use of mobile units, especially in low-incidence areas, and firmly supported the continued availability of chest x-ray facilities for individuals. Furthermore, it did not address itself to the emphasis of the editorial—the identification of the high-risk individual with "inactive" tuberculosis who would benefit from preventive chemotherapy.

Dr. Reichman questions the impact of the radiation dosage involved in a single chest roentgenogram. As reported by the National Council on Ra-
radiation Protection and Measurements, the average outdoor background level of radiation ranges from 90 to 220 millirads/yr up to 500 millirads/yr if one dwells in a brick or concrete structure. The daily wearing of a radioluminous wristwatch may expose a small part of the body to 4,000 millirads/yr. A single 14 × 17-in chest roentgenogram exposes a limited area of the body to 5 to 12 millirads per film. Studies by the radiologic engineering division of the Denver Health Department have demonstrated that photofluorographic units will deliver only 80 to 1,000 millirads per film if kept in good repair. A single dental film can yield up to 1,000 millirads. Genetic effects are minimized if the gonads are routinely shielded. We feel that this issue, in reality, is negligible.

Dr. Reichman also questioned if a cost/benefit analysis would demonstrate that it is cheaper to screen with a tuberculin test followed up by a chest x-ray film. The original study referred to in the editorial included a cost analysis (1970) which showed that the costs of administering and reading a skin test were quite similar to the cost of a single chest roentgenogram. Furthermore, substituting a tuberculin test for a chest x-ray film can lead to serious difficulties because of multiple problems in the interpretation of the tuberculin test. Of particular concern is the occasional occurrence of a negative tuberculin test in someone with “active” tuberculosis at the time of the initial tuberculin test when the earliest possible identification of the case is very important.

Dr. Reichman asserts that in his locale close to 90 percent of walk-in patients return to have the tuberculin test read. It is an impressive record, but many health departments don’t achieve this. In addition, one has to be concerned with the possible irrational behavior of someone who fears or has guilt about the possibility that he might have tuberculosis, such as those who have symptoms, those who suspect they have infected someone, or those who have been pressured into reporting by friends, professional associates, or health department staff. Such apprehensive individuals are often reluctant to tell the clinic staff anything except the fact that they want a chest x-ray examination. If their request for an x-ray examination is turned down, they can easily be “turned off” and fail to return to have the tuberculin test read. Should such a person have “active” pulmonary tuberculosis, a tuberculin test that is not read will not reveal this, but an x-ray film which is read should lead to a diagnosis of the case.

Finally, like most program directors, we are aware that the cost of any program is primarily the personnel. Once the capital expenditures are committed, maintenance and supplies represent only a small cost of an ongoing program. A diagnostic x-ray unit functioning as an integral component of a free, standing tuberculosis or chest clinic is seldom used to capacity; yet, for the convenience of the patient and to make better use of staff time, it is usually maintained on-site. Operation of such a unit as a “case-finding” tool adds only the cost of supplies. On the other hand, the keystone of a tuberculosis clinic is the nurse. Her time, a scarce commodity, is more wisely spent in the care of the identified patient rather than in case-finding programs.

In essence, as long as the formulae indicate that the free x-ray films for walk-in patients are identifying significant numbers of high-risk, “inactive,” treatable tuberculosis patients at a justifiable cost as well as the occasional “active” case, the program should be continued.

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REFERENCES