Further research should include identifying early markers of lung injury after lung secretion, the link between intraoperative FIO₂ and lung injury, immunomodulation of circulating mediators, and the effect of selective pulmonary vasodilators, such as nitric oxide, on pulmonary hemodynamics and gas exchange.

Mali Mathru, M.D., F.C.C.P.; and Laura B. McDaniel, M.D.
Galveston, Texas

University of Texas Medical Branch
Reprint requests: Dr. Mathru, Department of Anesthesiology, E-91, University of Texas Medical Branch, Galveston, TX 77555-0891.

REFERENCES
1 Bailey CC, Betts RH. Cardiac arrhythmias following pneumonectomy. N Engl J Med 1943; 229:556-59
5 Martin WJ, Rosenow EC. Amiodarone pulmonary toxicity. Recognition and pathogenesis (part 1). Chest 1988; 93:1067-75

Pulmonary Rehabilitation of Early COPD
COPD as a Systemic Disease

Pulmonary rehabilitation (PR) is an established method of care for patients with advanced COPD and related pulmonary disorders. It goes beyond ordinary care and involves patient and family education, breathing training and breathing exercises, systemic exercises, and patient support groups. All patients enrolled in a PR program also require the systematic use of both bronchoactive and strategic drugs. Oxygen is lifesaving in selected patients with chronic stable hypoxemia. Pulmonary rehabilitation improves the quality of life and probably extends useful life. It should be considered the standard of care for patients who wish to receive more than ordinary care.

Many healthcare workers with extensive experience in pulmonary rehabilitation have begun to ask the question, “Why not begin pulmonary rehabilitation before the late and often irreversible stages of disease? Why not begin pulmonary rehabilitation at a time when a major impact on disease prognosis is possible?” In support of the notion that pulmonary rehabilitation techniques should be initiated much earlier in the course of COPD, a recent study shows that significant exercise limitation is present in patients with only modest degrees of airflow obstruction. This important study presents important new data which suggest that a global impact of airflow obstruction begins in the early natural history of COPD. Thus, it is certainly possible that a vicious cycle of mild airflow limitation with resultant reduced activities of daily living begins and creates a state of premature morbidity well before advanced states of airflow obstruction and COPD occur. Couple this with the psychological counterpart of COPD which includes anxiety, depression, and somatic preoccupation, and we have the scenario of COPD as a systemic disease, from its basic origins.

Smoking, rightfully considered the root cause of COPD, may be used by patients to counter anxiety and depression. Smoking may also decrease food intake. Now a nutritional component becomes part of the puzzle of emerging COPD. Reduced caloric intake, protein restriction, failure to consume appropriate and protective amounts of antioxidant vitamins and insidiously emerging, but subtle multiple organ system dysfunction begins to dominate the tranquility and personal adaptations necessary for every human being to cope with an emerging and ultimately life-threatening chronic disease state. Undernutrition in COPD is associated with reduced immune responses, and this factor may create the opportunity for an increased number of bacterial and viral chest infections. Repeated infections cause additional metabolic and nutritional stresses on the patient. The stage is now set for an inexorable course of progressive functional decline.

To counter this conspiracy of events, patients with only mild degrees of airflow obstruction as identified...
by simple office spirometry can be encouraged and assisted in smoking cessation, exercise reconditioning via simple daily walks, and improvement in nutrition made possible by both smoking cessation and modified dietary intake.

Evidence has been presented that exercise can improve resistance to infection, and pulmonary rehabilitation can mitigate anxiety, depression, and somatic preoccupation, even in states of severe respiratory insufficiency. Improved nutrition can also recall suppressed immunologic responses in advanced stages of COPD. Now, what might have emerged as a rapid downhill slide or an avalanche course to disaster for the patient with early and mild stages of COPD can be turned into a detente. On an anecdotal basis, I have seen several middle-aged people with FEV₁ in the range of 2.0 to 2.5 respond remarkably to a combination of smoking cessation, daily exercise, and an improved diet, high in antioxidant vitamins.

If COPD is a systemic disease, like diabetes, I believe it is time to take a futurist approach to the early identification and intervention of the many interrelated pathways in the pathogenesis of COPD, which could create a collision course with disaster and replace this scenario with a treatment strategy aimed at improved survival and quality of life.

Thomas L. Petty, M.D., F.C.C.P.
Denver

Professor of Medicine, University of Colorado Health Sciences Center. Reprint requests: Dr. Petty, 1719 East 19th Avenue, Denver 80218

REFERENCES

5. Fishman DB, Petty TL. Physical, symptomatic and psychological improvement in patients receiving comprehensive care for chronic airway obstruction. J Chronic Dis 1971; 24:775-78

Unattended Studies of Sleep-Disordered Breathing

In this issue of Chest (see page 1759) results from an epidemiologic study of snoring and sleep-related oxygen desaturation in men are reported. The investigators used a commercial, four-channel recorder of heart rate, snoring sounds, body position, and oxygen saturation to collect data. They quantify the number of 4 percent or greater desaturation events per hour of sleep with an oxygen desaturation index (ODI). Almost 14 percent of their sample had desaturation rates suggesting sleep-disordered breathing (ODI > 10). Moreover, ODIs greater than 20 occurred in nearly 5 percent of men studied. These findings reinforce the laboratory-based report by Young and colleagues in 1993. They found apnea-hypopnea indices greater than 10 and 20 in 15 percent and 9 percent of middle-aged men, respectively. These striking prevalence statistics are two to five times greater than previously suspected, suggesting a health problem of enormous proportion.

Clinical Use of Unattended, Partial Polysomnography

For conducting epidemiologic investigations, portable, unattended monitoring systems offer certain advantages. They provide a less costly means for gathering useful, standardized, physiologic data in large population samples. To some it seems a logical extension to apply these techniques clinically. However, assessing sleep-related breathing for statistical purposes is quite different from diagnosing a pathologic condition in a patient. Although a large sample may overcome measurement inaccuracy, this is little consolation when faced with the responsibility for an individual’s medical care.

Clinically, the first question concerning unattended, partial polysomnography is whether the recording device accurately detects, classifies, and measures sleep-disordered breathing events. Review of the handful of published, peer-reviewed papers does not satisfactorily answer this question.

To dismiss this concern using a patient with severe obstructive sleep apnea as an example is to miss the point. When a patient has complete airway occlusion several hundred times each night, minimal instrumentation can document the pathologic findings. However, when apnea is moderate or when breathing events are predominately hypopnea, accurate detection and measurement become more difficult.

There is no manual of standardized terminology, technique, and criteria for scoring sleep-related breathing impairment. A recent attempt to develop one was abandoned. The scoring rules for apnea derive from early work by Guilleminault and colleagues; a few clinicians can tell you why a 10-s respiratory pause was chosen as criteria. Rules for scoring hypopnea vary. Polysomnographers primarily use qualitative or semiquantitative measures be-