

Topics in Primary Care Medicine

Outpatient Treatment of Chronic Obstructive Pulmonary Disease— A Practitioner's Guide

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"Topics in Primary Care Medicine" presents articles on common diagnostic or therapeutic problems encountered in primary care practice. Physicians interested in contributing to the series are encouraged to contact the series' editors.

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Chronic obstructive pulmonary disease (COPD), a collective term including emphysema, chronic bronchitis and adult nonallergic asthma, affects millions of persons in this country and is the 11th most common cause of death. Major advances have been made in the pharmacologic management of these patients over the past ten years. To provide a simple but fairly comprehensive guide for physicians who treat this disease in an outpatient setting, we have used a new method of displaying patient care decisions called a criteria map. This map (Figure 1) defines the major problems of these patients and offers specific suggestions, tailored to individual patient characteristics, regarding testing and therapy. The map was designed by a group of community-based primary care physicians and university-based pulmonologists (M.S.S., H.A.B.) to reflect both scientifically based "ideal" treatment and the practical demands of primary care practice. Where applicable, options are offered for tailoring a treatment plan to specific needs of a patient. Certain treatments, such as intermittent positive pressure breathing, have been omitted because they are controversial or of unproved value, though they may still be of use in carefully selected patients. The map, or indeed any guide to treatment, assumes that a patient's disorder has been correctly identified. The criteria for diagnosing COPD have been well described.

The criteria map deals with four major areas of outpatient care in cases of COPD: review and treatment of symptoms, review of medications and their side effects, laboratory monitoring and prophylaxis and education. Although not neces-

sarily included in every office visit, these are the basic components of outpatient care.

Using a Criteria Map

This criteria map is designed to simulate a normal comprehensive office visit of a patient previously diagnosed as having COPD. Each major section of the map (A through D) should be entered and completed for each patient. Within each section of the map are questions about possible symptoms, side effects, signs or laboratory test results. In each case, the response to the explicit or implied question leads to either an additional question or a recommended action (or a group of optional actions).

Review and Treatment of COPD Symptoms (Section A)

The map begins with an assessment of the major symptoms of COPD: dyspnea, wheezing, chest tightness and cough. If these symptoms have developed or worsened since the previous visit, the physician should exclude infection and heart failure before attributing the symptoms strictly to worsening of the airway disease.

Symptoms of infection such as fever, coryza or discoloration of sputum may be caused by pneumonia (bacterial or not), tracheobronchitis or a viral syndrome. Examination of the patient is mandatory. Fever, especially in the presence of new localized rales, suggests parenchymal infection. Depending on the severity of the apparent infection, the physician may choose to evaluate the sputum, obtain a chest x-ray

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ABBREVIATIONS USED IN TEXT

COPD = chronic obstructive pulmonary disease
 FEV₁ = forced expiratory volume in one second

film or treat empirically with a broad-spectrum antibiotic, such as tetracycline, ampicillin or trimethoprim/sulfamethoxazole. If rales and fever are absent, the physician may choose to observe the patient or to empirically give a course of antibiotics for reducing the typically mixed bacterial flora found in sputum cultures of patients with exacerbations of COPD. If in addition to worsening dyspnea a patient reports edema, orthopnea or paroxysmal nocturnal dyspnea, congestive heart failure should be considered. The findings of a left-sided third heart sound gallop and new rales would support this diagnosis but, even in the absence of these physical findings, a chest radiograph may show the typical findings of left ventricular failure: cardiomegaly, vascular redistribution and increased interstitial markings (Kerley B lines).

In the absence of evidence of heart failure or infection to explain the worsening of a patient's symptoms, certain tests may be helpful. The map presents the decision to do testing as optional, for it depends on many difficult-to-define factors such as a physician's familiarity with the patient, the patient's response during previous similar episodes and a judgment as to the reliability of the history.

Pulmonary function studies, such as the forced expiratory volume in one second (FEV₁), may be particularly helpful if they show significant worsening—that is, 20% or more—as a change of this magnitude usually requires more intensive therapy. Arterial blood gas values may indicate hypoxemia severe enough to require further evaluation and, if hypoxemia persists, oxygen supplementation. Without a clear-cut historical, physical or laboratory explanation for a patient's deterioration, a chest radiograph may be obtained to uncover otherwise silent problems such as pneumonia, heart failure or lung cancer.

In doing a diagnostic workup of a patient whose symptoms have worsened, the next step is to determine if the medication regimen is optimal. The two major categories of drugs used for treating COPD are bronchodilators and corticosteroids. Cromolyn sodium is rarely effective in the treatment of COPD and has been omitted from the map. The bronchodilators include theophylline preparations and oral and inhaled sympathomimetics. The physician panel generally preferred the new long-acting theophylline preparations. The precise definition of "maximal" dosages of these drugs is difficult and may be controversial, but the following guidelines were selected: (1) a "maximal" dosage of a theophylline preparation has been reached when peak blood concentrations of the drug are between 15 and 20 mg per liter or when intolerable side effects have occurred, such as nausea, vomiting, diarrhea, tremors or insomnia; (2) blood concentrations of sympathomimetic drugs are not yet available, so the upper dose range is defined by the presence of limiting side effects—that is, tremors or palpitations—or the use of the maximum dosage recommended by the manufacturer (metaproterenol sulfate, 20 mg four times a day; terbutaline sulfate, 5 mg three times a day; albuterol sulfate, 4 mg three times a day), and (3) the inhaled sympathomimetic dosage is considered "maximal" if a patient uses 12 puffs per day in divided dosages (metaproter-

enol, 600 µg per puff; albuterol, 90 µg per puff; terbutaline, 200 µg per puff, or isoetharine, 300 µg per puff), although this level may still be inadequate for some patients. If symptoms have not resolved satisfactorily after the bronchodilator regimen has been increased to a maximum level, then the physician should prescribe a brief course of oral corticosteroids (usual starting dose, 0.5 to 1.0 mg per kg of body weight per day of prednisone or equivalent), order additional laboratory studies, obtain a consultation or recommend admission to hospital.

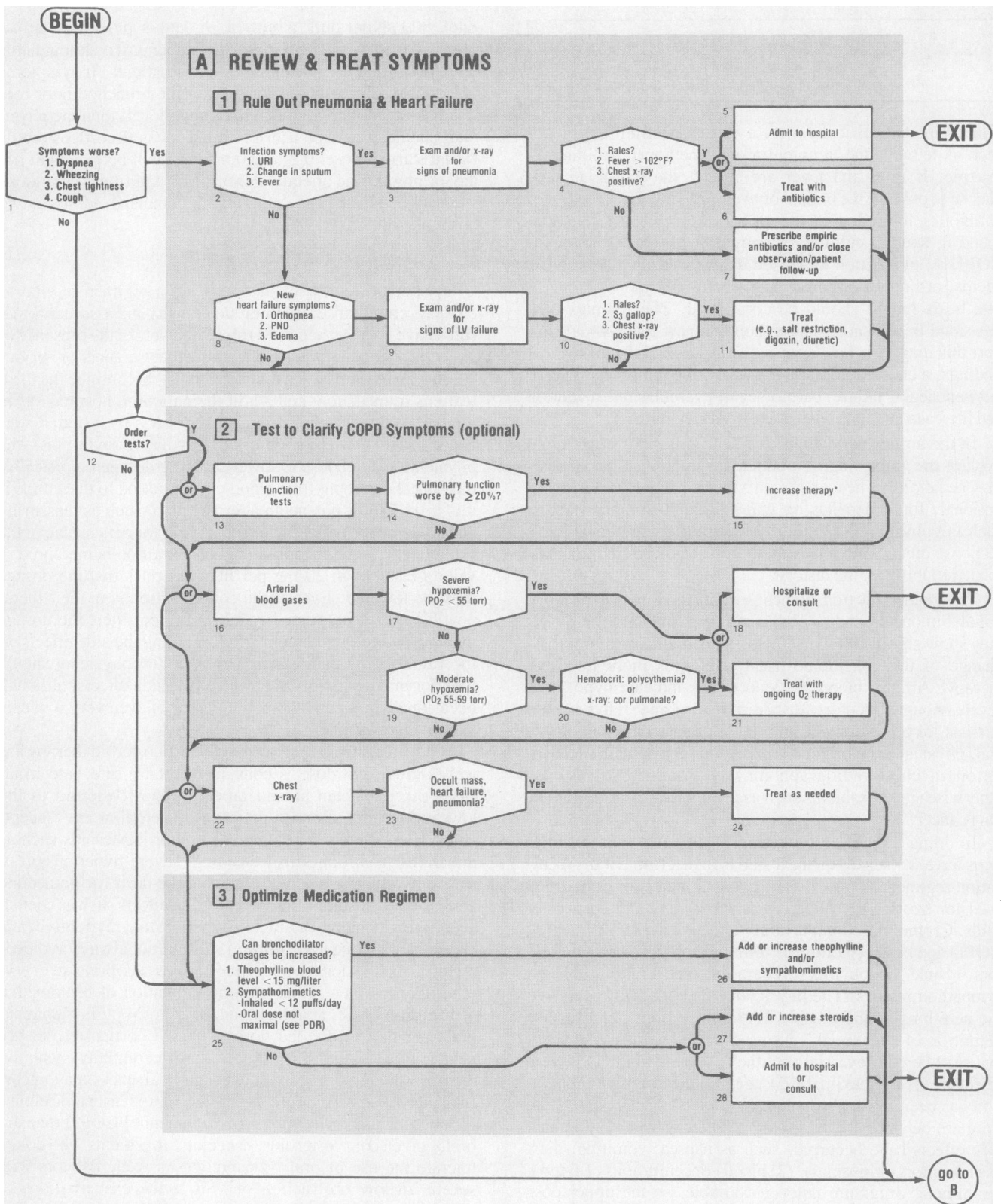
Review Medications (Section B)

A specific review of the medication regimen is vital to evaluate compliance, monitor side effects and assure that steroids have been reduced to a minimal level. In the presence of major bronchodilator side effects such as seizures or serious cardiac arrhythmias, the physician must discontinue the medications immediately and admit the patient to hospital. With minor side effects—gastrointestinal or nervous system disturbances such as tremor or minor cardiac arrhythmias—the physician may choose to lower the drug dosage empirically, measure the theophylline blood concentration to determine if it is increased or pursue an alternate plan, such as reassuring and advising the patient while observing for persistence of the side effects. If the theophylline concentration is measured, a value greater than 20 mg per liter indicates that the dosage must be lowered. Even if the concentration is in the "therapeutic" range, between 10 and 20 mg per liter, the dosage may be lowered in the hope of eliminating the side effects. If the value is less than 10 mg per liter, the physician should look for an alternate explanation of the side effects, although occasionally patients will be intolerant of even very low dosages of theophylline.

Side effects from long-term oral corticosteroid therapy are well known. No dose is considered totally safe, and in all cases the physician should taper the corticosteroid to the lowest dose that allows a patient to function at an "acceptable" level. Major side effects from corticosteroids such as infections, gastrointestinal bleeding, severe hypertension or severe psychiatric disorders indicate the need for immediate admission to hospital. Less serious side effects such as edema, acne, weight gain, cataracts, hypertension, hyperglycemia and many others can be minimized (but not always avoided) by lowering the dosage of corticosteroids, adopting an every-other-day regimen or substituting inhalation of beclomethasone dipropionate, to a maximum of 20 to 24 puffs (50 µg per puff) per day in divided doses. Inhaled corticosteroids are nearly free of the side effects that accompany systemic therapy, though oral candidiasis and hoarseness may occur. Inhaled corticosteroids are therefore a more reasonable choice for ongoing use earlier in the management of COPD than are orally given corticosteroids, especially in patients who do not tolerate the use of oral bronchodilators well. Patients with severe airflow obstruction or with acute exacerbations of COPD may have difficulty tolerating inhaled beclomethasone, so its use is often begun after a brief course of oral corticosteroids.

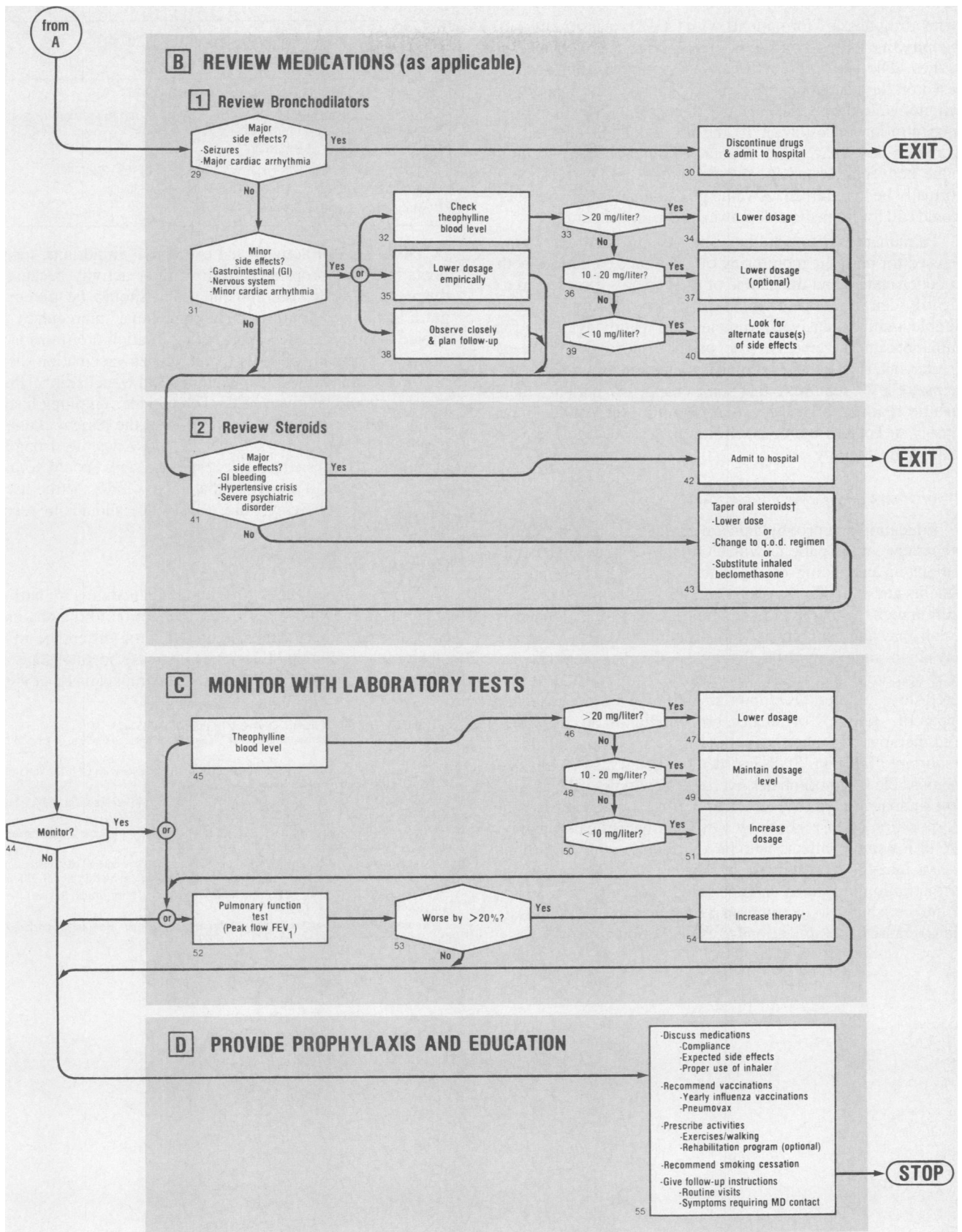
Laboratory Monitoring (Section C)

Even in the absence of uncontrolled symptoms or drug side effects, two laboratory tests may be of assistance in moni-



FEV₁ = forced expiratory volume in one second; LV = left ventricular; PDR = *Physician's Desk Reference*; PND = paroxysmal nocturnal dyspnea; q.o.d. = every other day; URI = upper respiratory [tract] infection

Figure 1.—A “criteria map” for chronic obstructive pulmonary disease (COPD). The map deals with four major areas of outpatient care in cases of COPD: **A**, Review and treatment of symptoms; **B**, Review of medications and their side effects; **C**, Laboratory monitoring; **D**, Prophylaxis and education. The criteria map has a BEGIN point, EXIT points when a patient enters the hospital or is sent to a chest physician for consultation and a STOP when the four sections of the maps have been traversed. Hexagonal shapes represent possible signs and symptoms of COPD patients; rectangles indicate subsequent physician actions. Arrows direct one from signs or symptoms to physician actions through each section and from one section to the subsequent section. When several alternative actions are acceptable, or signs appear in the map.



*"Increase therapy": Add or increase theophylline, oral or inhaled sympathomimetics or inhaled corticosteroids. If these are all at maximal levels (see box #25), oral corticosteroids may be added to the regimen.

†"Taper oral steroids": Physicians should attempt to taper doses of oral corticosteroids at all times.

toring drug therapy for patients with COPD: measurement of theophylline blood concentrations and pulmonary function studies. The map presents treatment options in this section based on the results of these tests independent of changes in symptoms. In the absence of side effects, a blood theophylline concentration of less than 10 mg per liter indicates that an increased dose may result in greater clinical benefit. With a value between 10 and 20 mg per liter, the dosage should normally be maintained. A value greater than 20 mg per liter would call for immediate downward dose adjustment.

Pulmonary function studies, such as spirometry, can also be used for periodic monitoring of a patient's condition, both to better understand the course of the person's disease and to identify deterioration of which the patient may be unaware. Simple and inexpensive spirometers are readily available for outpatient measurements. The panel decided that 20% or greater deterioration in pulmonary function, such as in decreased FEV₁, requires either some change in a patient's therapeutic regimen or the decision to follow the patient more closely to be sure the deterioration is sustained before augmenting the therapy.

Prophylaxis and Patient Education (Section D)

Education and prophylaxis are critical components of the outpatient care of patients with COPD. We believe that better patient understanding of the nature of the disease and the benefits and side effects of medications results in better cooperation with the therapeutic regimen. Printed educational materials may augment physician instruction. At every visit, the physician should specifically review the drug regimen regarding compliance and side effects. Because misuse of metered-dose inhalers is common and may be a cause for apparent "failure" of inhaled bronchodilator or corticosteroid therapy, repeated instruction in the use of the inhaler is important (Table 1). Such instruction should also emphasize the possible harm of inhaler overuse. Newly described reservoir or spacer devices (Aerochamber by Monaghan Medical Corporation or InspirEase by Key Pharmaceuticals) may be useful for some patients who have difficulty with the proper use of inhalers or in whom local side effects develop from them. Follow-up plans should include not only regular appointments but also instructions as to when to call the physician because of complications or exacerbations.

TABLE 1.—Instructions for Correct Use of Metered-Dose Inhalers

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| <p>Hold inhaler with canister inverted and shake well</p> <p>Place mouthpiece between teeth or just outside the open mouth (keep tongue and teeth from blocking the opening)</p> <p>Exhale to the end of a normal breath</p> <p>Activate the inhaler <i>while</i> slowly breathing in to full inspiration</p> <p>Hold the breath for 5 to 10 seconds and exhale slowly</p> <p>Wait 1 to 20 minutes before repeating</p> |
|---|

Discussion of activity and exercise is important, for patients may inappropriately restrict their activity because of dyspnea. Specific recommendations should be given regarding home activities (including sexual intercourse) and choice of exercise. Referral to rehabilitation programs is appropriate for many patients. An influenza vaccination should be offered annually and pneumococcal vaccination (Pneumovax) should be given once. The patient's smoking history should be reviewed periodically even if the patient claims to have quit. If a patient continues to smoke despite strong and unambiguous physician advice, specific steps should be taken such as referral to smoking-abatement clinics or the use of nicotine resin chewing gum (Nicorette) should be recommended.

Conclusion

The care of a patient with COPD is demanding for both the patient and the physician. Careful attention to the details of care discussed here can make a dramatic difference in the quality of the patients' lives, may decrease hospital stays and days of disability and may even have an impact on longevity.

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