In a recent issue of Pulmonary Perspectives, the editorial board commentary following a review article on cardiopulmonary exercise testing states that:

Cardiopulmonary exercise testing is one of the most elaborate and elegant clinical applications of human physiology. It can also be a valuable clinical tool, but the volume of data collected makes standardization and interpretation major issues, as this Perspective details. Since state-of-the-art systems are readily available, consensus on performance and application of this testing is truly needed. Interpretation will also be important and often depends on the reasons why the patient is being studied and the specific questions being asked.

The article also highlights the importance of assessing patient safety during exercise testing and reemphasizes the utility of continuous ECG, blood pressure, and pulse oximetry monitoring for the duration of exercise and in the recovery period. It is likely that interest in these measurements will grow because of the ready availability of computer processing capacity and more rapidly responsive analyzers. The need for standardization is apparent, and the next steps will be interesting and valuable ones.

Certainly, the combined data of Nakanishi et al are interesting, and the technology to reproduce them is available in many exercise testing units; however, future research and validation will be necessary to confirm their application. Data from greater numbers of NYHA class 3 and 4 patients may be revealing and may help clarify the functionality of the technique.

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**Feedback on Medication Dosing Enhances Patient Compliance**

The axiom "Patients tell us what they think we want to hear" now has a corollary: "Patients try to appear compliant for a visit to the doctor." In this issue, Nides et al (see page 501) report that 15 percent of patients who did not know how they were being monitored emptied their nebulizer just before the visit so that it would be light in weight when checked. Similar stories of pill dumping are well known in all fields of medicine. The issue of exactly how patients are taking their medications is crucial in a clinical trial in which determination of efficacy is made and reported to the medical community. Undetected partial compliance can void an otherwise important difference between treatments because the drugs are not used in a standardized manner as required by the protocol.

The Lung Health Study Group demonstrated the value of showing reports to patients to help them understand their pattern of medication usage, thereby enhancing the success of the clinical trial. A variety of monitors are available for clinical research (pill, liquid, and aerosol dispensers). Use of this technology has equally important implications for treatment effectiveness in managed-care settings. The low cost of monitoring patients whose medical course is unstable would easily be recouped by avoiding extra visits, medication changes, and laboratory tests.

The new microelectronic monitoring technology allows clinicians and researchers to better understand whether a medication (or dose level) has failed because of inefficiency or failure of the patient to take the medication as directed. This concept has broad implications not only for improving patient outcome, but also for reducing the cost of medical care. Patients with chronic diseases who should maintain a careful regimen of prophylactic treatment often require extra medical attention because of exacerbations caused by partial or erratic compliance or a period of noncompliance. Unfortunately, a physician rarely knows what led to the medical problem and is faced with a decision to increase the dose, change the medication, or add another treatment. If the patient had used a microelectronic device, the printed report would clearly document the pattern of self-administration, simplifying the physician's decision-making process. As Nides et al comment, patients are often unaware of their lapses in doses. Forgetfulness, other priorities, misunderstanding of instructions—all are typical reasons for missed doses. In another recent report in this journal, Mann et al described microelectronic monitoring data for a qid regimen of beclomethasone. They found no significant correlation between medication compliance and asthma severity, suggesting other
issues for exacerbations.

In the absence of a device, I urge all health-care providers to be more specific with two aspects of the clinical interview:5 (1) Provide specific instructions to patients, in the form of either a handwritten note (apart from the prescription) or a preprinted list of detailed instructions. (2) Ask the patient at every visit how he or she takes the medication. Ask for the name of the pill, number of pills, and times the doses are taken. Provide feedback on the optimum dose regimen guided by the pharmacokinetics of these specific drugs. Children and adolescents should also be able to tell you when they take their medication to encourage their sense of responsibility.

Yes, microelectronic monitoring costs some money and some time. Nonetheless, the costs are far lower than the potential gain in clinical trial efficiency, improved clinical care of patients, and the rational use of health care in managed-care settings.

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REFERENCES
3 Cramer JA, Scheyer RD, Mattson RH. Compliance declines between clinic visits. Arch Intern Med 1990; 150:1509-10

Building Consensus on the Use of Mechanical Ventilation

Mechanical ventilators are cornerstones of respiratory life support. Their original designs were based on the physiologic principles of bulk-flow ventilation and alveolar recruitment through the application of positive airway pressure. Over the past several decades, these devices have evolved from simple pressure and flow generators into highly sophisticated microprocessor-controlled systems capable of very high gas outputs, complex monitoring, Servo-feedback controls, and the capability to interact with a patient's spontaneous ventilatory efforts.

In a number of ways, however, this evolution has been flawed. Specifically: (1) A jargon-laden nomenclature has developed that is imprecise, confusing, and sometimes contradictory. (2) The validation of new support features has usually been based on engineering or physiologic rationales, not clinical outcome data. (3) Monitoring and alarm strategies have been added as quickly as possible without clear outcome goals (except perhaps to "cover" oneself), often seeming only to increase ICU "noise pollution." (4) Ordering strategies by physicians have often been based on "routines" rather than physiologic or clinical goals. (5) While pneumothorax and cardiovascular compromise have long been recognized as complications of positive-pressure ventilation, awareness has been slow to grow regarding other potential harmful effects of mechanical ventilation (eg, more subtle alveolar injury from alveolar overdistension, imposed patient work loads from poor demand systems or inadequate assist flow).

Correcting these flaws with solid clinical data is obviously desirable but clearly not possible at the present time. Because of this, it seems reasonable for professional organizations to periodically convene consensus conferences in order for experienced scientists and practitioners to review what data are available and to decide what has clinical rationale for the present. One such conference was recently convened by the American Association for Respiratory Care (AARC) and funded by the American Respiratory Care Foundation to focus on basic design principles of a mechanical ventilator. The ACCP has also convened a consensus group to build on these principles and formulate the rationale behind the use of various support strategies. This will be forthcoming in 1993. Below are summarized what I view as the more important results of the AARC conference and document:

1. Terminology. A reasonable classification system for mechanical breaths and support modes was developed. Use of this system will hopefully eliminate the vast array of proprietary terms and jargon that constitute the current "language" of mechanical ventilatory support. This is vital for reasonable discussion of various designs and strategies of support.
2. Support features. Since data supporting one specific feature or mode over another are usually minimal, the AARC consensus group avoided endorsing or condemning specific modes. Rather, the consensus group aimed at concepts (eg, the ability of the patient to control breath rate, the ability of the patient to have flow interactions). These features were then labeled as essential, recommended, or optional depending upon patient setting. As noted above, the ACCP Consensus group has the task of reviewing how