Inappropriate Applications of IMV

To the Editor:

Many patients require mechanical ventilatory support for myriad reasons. When the factors precipitating respiratory failure are alleviated, mechanical ventilation is no longer required, and weaning, regardless of the technique, usually progresses with ease. On occasion, some patients may have difficulty in resuming total spontaneous respiration; this is the group representing Dr. Williams’ concern (see page 804, this issue). If the patient’s disease process is accurately assessed and if lung compliance, thoracic compliance, respiratory muscle strength and respiratory drive allow total, unassisted respiration, weaning should occur with little difficulty. However, two problems, both peripherally identified by Dr. Williams, may impede this process.

The respiratory muscles of patients whose breathing is mechanically controlled for variable periods may become discoordinated when spontaneous respiration is attempted. Such patients often require careful attention from qualified staff, and the respiratory muscles must be retrained before the patient can regain a coordinated and effective ventilatory pattern. Andersen et al1 have found that patients who received intermittent mandatory ventilation (IMV) throughout the course of their ventilatory therapy and who were allowed to have some degree of spontaneous respiration at all times did not incur a discoordinated breathing pattern.

The second problem identified by Williams can result from inadequate equipment used to provide IMV. Unnecessary restriction of inspiratory flow by one-way valves, narrow-bore tubing, right-angle connectors, humidifying devices or insensitive demand valves impose greater work of breathing which some patients cannot tolerate. I define IMV as a mode of ventilatory support to be used as a means of providing mechanical ventilatory support that allows unassisted and unrestricted spontaneous respiration to persist between mechanically mediated breaths. Initially, some patients may not have the ability to generate tidal volume spontaneously. In this instance, IMV is mechanically and physiologically equivalent to controlled mechanical ventilation as practiced by Dr. Williams. However, many patients do have sufficient respiratory drive and strength to support some degree of ventilatory effort. In such patients, use of hyperventilation, sedation or muscle relaxants, adjuncts often required to provide controlled ventilation, can be avoided by using IMV. The rate and volume of mechanical ventilation delivered to the patient can be adjusted to maintain normal arterial pH and, thus, significant alkalosis can be avoided. Diminished respiratory drive, often a problem when weaning patients with chronic CO2 retention from controlled ventilation, is rarely a problem when weaning with IMV. The respiratory muscles of the patient who breathes spontaneously throughout the course of mechanical ventilatory therapy do not require retraining and the discoordination of respiratory muscles can be prevented by appropriately applied IMV.2 As the rate of IMV is gradually decreased and normal arterial pH is maintained, it is apparent that lung compliance, thoracic compliance, respiratory muscle strength, and respiratory drive become increasingly adequate to support total spontaneous respiration. Only when IMV follows a prolonged course of controlled ventilation will alkalosis, diminished respiratory drive and discoordinated breathing patterns occur.

Dr. Williams discusses the ineffective respiratory efforts and the paradoxical inward movement of the abdomen when his patients received IMV. Such observations indicate that his patients were breathing against a significant degree of airway obstruction. Possibly, his therapists were using high-resistance, low-flow circuits which add considerably to the patient’s work of breathing. This contention is further supported by the observation that many patients breathed more effectively, with a low-resistance T-piece circuit, than with IMV. If a patient is required to exert inspiratory effort to generate as little as 3 cm H2O airway pressure drop, the tidal volume may be reduced several hundred ml. As defined earlier, IMV must provide a flow sufficient to meet the patient’s rate of peak inspiratory flow, in order to avoid added work of breathing.

The most disturbing problem delineated by Dr. Williams was the existence of an “... independent respiratory therapy service ...” providing “... increasingly complicated respirators, ...”. Such circumstances usually result from inadequate medical supervision in the form of the delegation of responsibility for equipment and patient care to inadequately trained technicians. This unfortunately common practice is not to be condoned because the problems described by Williams are inevitable. IMV cannot be viewed as a substitute for trained personnel who will, “... encourage patients to generate their own respiratory muscle activity, ...”. Rather, IMV should be viewed as a technique that does not suppress such activity by unphysiologic means.

The problems described by Dr. Williams are common. To blame a useful therapeutic tool for these problems is inappropriate. I agree with Dr. Williams that the solution is simple. All therapeutic modalities, including IMV, must be applied appropriately by using proper equipment under adequate medical supervision.

John B. Downs, M.D., F.C.C.P.
Director, Anesthesiology and Pulmonary Medicine, Mercy Hospital, Urbana, Illinois and Associate Professor of Anesthesiology and Surgery, University of Florida College of Medicine, Gainesville, Florida

Reprint requests: Dr. Downs, Mercy Hospital, 1400 West Park, Urbana, Illinois 61801

REFERENCES