

Editorial Views

On the Selection of Respirators

THE DATA presented by Amaha, Liu, Weitzner, and Harmel in this issue of the JOURNAL reconfirm earlier work demonstrating that the effect of a decrease in lung-thorax compliance on pressure-cycled respirators is to reduce the tidal volume delivered and to increase the respiratory rate, while volume-cycled or time-cycled machines generate higher pressures and thus maintain a more constant minute volume and alveolar ventilation.

This again raises the question of selection of a respirator. There are those who advocate only the use of volume or time-cycled machines because of the aforementioned characteristics. One should not conclude, however, from the observations of Amaha *et al.*, that the time-cycled or volume-cycled machine is superior for use in the clinical setting. (It is notable that a constant minute ventilation does not in itself insure adequacy of ventilation. In the patient with advanced lung disease, the volume required to maintain normal levels of arterial P_{CO_2} may vary significantly from hour to hour.) Even though the time-cycled or volume-cycled machines clearly respond in a desirable fashion to changes in compliance (and airway resistance), they respond less than ideally to external leaks in the respirator-patient system. In contrast, the pressure-cycled machines compensate for small leaks and give a clearly audible warning by becoming "stuck" in the inspiratory phase if the rate of leak exceeds the inspiratory flow rate being delivered. Volume-cycled and time-cycled machines do not compensate for leak and give no audible or visual warning even when the patient is in serious distress should, for in-

stance, the machine be inadvertently disconnected from the patient. We have seen patients suffer undetected hypoventilation—progressing to cardiac arrest from this occurrence, while in the operating room with an anesthetist in attendance; and this hazard is even greater on the ward where monitoring is not on a minute to minute basis. Ideally, the expired tidal volume should be continuously monitored on both types of machine, with visual and audible alarms if the volume falls below a pre-set level.

In addition to the response to changes in compliance and leak, a number of other factors should enter into the selection of a respirator for clinical use: size, price, adaptability and flexibility, ease of sterilization, simplicity, facilities for maintenance and repair, power supply, reliability of components, ability to control composition of inspired gases, adequacy of humidification system, ability to deliver aerosol medication in measured dosage, the specific problem for which used, and the training and experience of the personnel who will use it. For example, where space and money are at a premium, the Engström respirator would not be suitable; it is possible to equip an entire inhalation therapy unit for the price of one of these machines.

Optimum performance of a respirator may dictate selection; in the patient with a severely decreased lung compliance or increase airway resistance, the standard model Bird and Bennett respirators may not be capable of generating the airway pressure and flow rate necessary to provide adequate ventilation. The volume-cycled and time-cycled machines, by virtue of their design, are "a stronger hand on

the bag" and are commonly utilized in this instance. A commercially available model of a pressure-cycled respirator (Bird) is also applicable; it is an equally "strong hand" and capable of generating enough pressure and flow to ventilate the lungs in the most severe clinical problems encountered. Special performance characteristics are required for ventilation of the newborn and machines specifically designed for this purpose are available.

For use outside the operating room, such as in the intensive care unit, it is desirable in most hospitals to have a minimal variety of machines to facilitate care by non-medical person-

nel. Some centers achieve excellent results with volume-cycled or time-cycled respirators, while others achieve equally good results with pressure-cycled respirators. This would lead one to infer that the machine is a less important factor than the understanding of its operation and hazards, as well as familiarity with principles of respiratory physiology by those responsible for operating the equipment.

MORLEY M. SINGER, M.D.
Department of Anesthesia
University of California Medical Center
San Francisco

Good News from the Middle East

ANESTHESIOLOGISTS the world over, so like other members of the animal species, crave the companionship of others to dispel the discouragements that are so often bred of isolation. For this reason societies are formed, gatherings take place and lines of communication are established. The latter frequently take the form of journals; and medical journalism, according to Garland, has been with us ever since 1679 when one Nicholas de Blegny put forth a tract styled, "Nouvelles découvertes sur toutes les parties de la médecine."¹ It has since been said that it is as useless to advise a man not to start a new journal as it is to advise him not to commit suicide.²

But there is no hint of self destruction—rather a note of optimism and hope for the future in the *Middle East Journal of Anaesthesiology*, the first copy of which we received just a short while ago. Edited by the dynamic and farsighted Bernard Brandstater at the American University of Beirut, the new journal is both handsome and sober in its gray and gold-trimmed cover, on which is inscribed an apt quotation from Hamlet, "For some must watch, while some must sleep." As further evidence of an emerging solidarity in that part of the world, the first issue contains several papers that were given at the Middle East Society's First International Congress held in

Beirut in the fall of 1965. Along with the title, a symposium on "Our Manpower Shortage" speaks of this as being a nearly universal problem. No great imagination is required to understand the problems that are to be faced in the establishment of an enduring Society in the Middle East, where all should be permitted a share in membership. A beginning has been made, however, and anesthesiology perhaps can show the way toward dissipating the political, ethnic, lingual and religious barriers that are constantly before us.

Samuel D. Gross³ has said of books, and Garland applied the same remark to journals, "Some fall stillborn from the press, many die in their infancy, a few attain to a vigorous manhood, and, now and then, one is fortunate enough to reach old age." At last count there were some 34 journals devoted solely to anesthesia, representing 17 countries throughout the world.⁴ The eldest of the periodicals is *Current Researches in Anesthesia and Analgesia*, founded in 1922 by the redoubtable Francis H. McMechan, followed within a year by the *British Journal of Anaesthesia*, one of the few monthlies extant. Those that were conceived in the thirties and forties were few in number, but the sixth decade witnessed a remarkable surge in anesthetic journalism. The Editor of the newest of the journals recognizes the pit-