

We begin this issue of RESPIRATORY CARE with 3 papers that deal with the flow-volume loop in general, and inspiratory flow in particular. As pointed out in the editorial by Ruppel, the inspiratory flow has received minimal attention in guidelines for standardization of spirometry. The 2005 American Thoracic Society/European Respiratory Society guidelines on spirometry *do* emphasize examination of the inspiratory curve of the flow-volume loop for evidence of intrathoracic or extrathoracic upper-airway obstruction. As Ruppel indicates, it is important that inspiratory curves are reviewed in the context of the clinical question being asked.

The paper by Sterner et al reviewed the flow-volume loops from a large number of subjects with essentially normal spirometry. As Ruppel notes, the most important finding of this study was that almost 50% of the abnormal inspiratory loops were the result of poor effort. Sterner et al recommend that an abnormal inspiratory curve in the presence of otherwise normal spirometry should prompt further evaluation. If more than one inspiratory curve is abnormal, both anatomical and functional evaluation should be undertaken for intrathoracic and extrathoracic upper-airway obstruction.

Watson et al evaluated whether flow-volume curves can detect vocal cord dysfunction (VCD). They studied a large number of subjects who had VCD determined by laryngoscopy. With the spirometric data from the effort that had the subjectively determined best inspiratory curve, and after controlling for the reproducibility of the inspiratory curves, none of spirometric variables was predictive of VCD. Independent predictors of VCD included female sex and obesity. The authors concluded that VCD remains difficult to predict with spirometry or the flow-volume loop. If VCD is suspected, a normal flow-volume loop pattern should not influence the decision to perform laryngoscopy.

The third paper related to the flow-volume loop is by Modrykamien et al. Only 7.5% of the subjects in this study had upper-airway obstruction. They included visual and quantitative evaluation of flow-volume loops and included variables based on inspiratory flow. With evidence from bronchoscopy, computed tomography, and laryn-

gосcopy, they found that neither visual criteria nor individual quantitative measurements that suggested upper-airway obstruction were predictive for identifying abnormalities. The combination of the 4 quantitative criteria showed low sensitivity for detecting upper-airway obstruction, but exceeded that of visual criteria. The aggregate criterion increased the sensitivity to 69.4%, which suggests the need for additional criteria to help predict upper-airway obstruction.

As Branson states in his editorial, conditioning inspired gases during mechanical ventilation by adding heat and humidity is a well accepted standard of care. Clinicians often presume there is adequate humidification in the ventilator circuit if the Y-piece is at a specified temperature. However, control of Y-piece temperature may be inadequate to ensure adequate humidification. Solomita et al developed an in vitro bench model to measure water-vapor delivery with heated humidification systems. They found that maintaining temperature at the Y-piece does *not* ensure adequate water-vapor delivery. At a given temperature, humidification may be significantly higher or lower than expected. Because their system collects virtually all water vapor, it measures absolute humidity. It may also be important to measure relative humidity, as both absolute humidity and relative humidity of the inspired gas might be important during mechanical ventilation. As Branson suggests, clinical assessment is our most reliable tool because robust humidity sensors are not yet available for clinical use.

Accurate determination of caloric requirements is an essential component of nutritional support in ICU patients. Pirat et al compared measured and estimated resting energy expenditures in critically ill cancer patients. They found that clinically estimated resting energy expenditure was associated with appropriate feeding in approximately 15% of the patients. The Harris-Benedict basal energy expenditure was associated with appropriate feeding in approximately 41% of the patients. They concluded that indirect calorimetry is the method of choice for determining caloric need in critically ill cancer patients. However, if indirect calorimetry is not available or feasible, the Harris-Benedict equation without added stress and activity factors is

more accurate than the clinically estimated resting energy expenditure.

Also in this issue, Walker and Heuberger review the limitations of 7 equations to predict energy expenditure. They conclude that prediction equations applied to critically ill patients are rarely within 10% of the measured energy expenditure, and recommend that indirect calorimetry should be used to determine caloric needs in critically ill patients. Differing from Pirat et al, Walker and Heuberger do *not* recommend use of the Harris-Benedict equation. If a prediction equation must be used, Walker and Heuberger favor the 1998 and 2003 Penn State equations, the 1992 Ireton-Jones equation, and the Swinamer equation. In an accompanying editorial, McArthur suggests that indirect calorimetry is the method of choice to estimate caloric requirements in critically ill, mechanically ventilated patients.

Aerosol therapy via small-volume nebulizer accounts for a large proportion of the respiratory care workload. Treatment time is mostly nebulization time, which is highly variable, depending on nebulizer design. Hoisington et al studied the workload effect of adopting a faster nebulizer. They reported a time savings from using the faster nebulizer that corresponded to 1.8 full-time equivalents. They suggest that these time savings could be used for value-added patient-care activities, and that the shorter treatment times could play a role in coping with the national shortage of qualified respiratory therapists. In an accompanying editorial, Colice comments that an early conversion from nebulizer to metered dose inhaler or dry powder inhaler can also allow more efficient administration of bronchodilators and save substantial time. Bronchodilator protocols, especially those that include long-acting inhaled bronchodilators, can also reduce workload and benefit patients.

Prevention of nosocomial infections is receiving a lot of attention in acute care hospitals. Person-to-person transmission of microorganisms is well recognized, but the role of fomites in nosocomial infection is not as well understood. Little attention has been paid to nonmedical devices as fomites. Wolfe et al collected bacteria from pens used by respiratory therapists in an intensive care unit following their work shifts. Although they found no organisms that are regularly associated with nosocomial infections, their results suggest that pens

can be fomites responsible for nosocomial infections. The authors suggest that protocols to reduce the transmission of infectious agents may need to be extended to writing instruments. One possible measure is to assign specific writing instruments to specific rooms.

Positive-expiratory-pressure (PEP) therapy uses positive airway pressure generated by either a fixed-orifice resistor or a threshold resistor. A clinician can easily build a PEP bottle from low-cost parts. A homemade PEP bottle is an inexpensive alternative to commercially available devices. Mestriner et al evaluated the performance of such a homemade system. The results of this study should be of interest to those who choose a homemade system over more expensive commercial alternatives.

As stated by Schechter, airway clearance therapy (ACT) is considered one of the cornerstones of therapy for the treatment of patients with cystic fibrosis, and a variety of ACTs have been developed. The Cystic Fibrosis Foundation established a committee to examine the clinical evidence for ACTs and provide guidance for their use. The committee recommends that airway clearance be performed on a regular basis in all patients with cystic fibrosis. Because there is no ACT that has been shown to be superior to others, the specific therapy should be individualized. Aerobic exercise is also recommended as an adjunctive therapy for airway clearance.

This month's case report describes the management of a patient with post-traumatic pulmonary pseudocyst. The Teaching Care of the Month describes the care of 96-year-old woman who presents many years after receiving therapeutic pneumothorax to treat tuberculosis.

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