blood cultures prior to the initiation of antibiotic therapy may conflict directly with an emphasis on avoiding delay in providing the first dose of an antibiotic, a quality-of-care issue that has been demonstrated to affect outcome.  

Recommendations against routine diagnostic testing are based on the lack of sensitivity of and the turnaround time of the currently available tests. Newer diagnostic tools, such as the detection of microbial DNA using a variety of polymerase chain reaction (PCR)-based techniques, show considerable promise. The ability to rapidly screen not only for pathogens but also for antibiotic resistance either with PCR or other molecular diagnostic techniques could substantially alter our approach to the management of patients with CAP in the future. Until then, the stratification of the diagnostic workup by severity, patient characteristics, and anticipated empirical antibiotic therapy is likely to lead to the most cost-effective overall care of patients with CAP.

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Weaning the Difficult Patient
The Evolution From Art to Science

Weaning patients from mechanical ventilatory support remains a significant challenge. Determining the optimal time and mode of weaning has been described as “an arbitrary clinical decision based on judgment and experience.” The fact that 50% of self-extubated patients do not require reintubation suggests that our judgment and experience are far from complete.  

The difficulty we still have in discontinuing mechanical ventilatory support is evidenced by the fact that 40% of the time that a patient spends receiving mechanical ventilation is devoted to weaning. Research performed in the last decade has yielded vital information that is making weaning more of a science and less of an art.

The utilization of traditional respiratory parameters such as the peak negative pressure, tidal volume (VT), respiratory rate, spontaneous minute ventilation, and the maximum voluntary ventilation have been shown to have poor predictive value in determining weaning outcomes. Newer parameters, such as the ratio of respiratory frequency to VT, ie, the rapid shallow breathing index (RSBI), have a better
positive predictive value but still have an unacceptably poor negative predictive value. Many elderly patients with chronic cardiopulmonary diseases adapt by increasing their respiratory frequency while limiting the depth of each breath, thereby limiting energy expenditure per level of ventilation and avoiding respiratory muscle fatigue. Thus, the use of the RSBI, especially in the elderly, may unnecessarily prolong the use of mechanical ventilatory support.5

The best predictor of weaning outcome, to date, is the assessment of respiratory capacity by a trained clinician at the bedside during a spontaneous breathing trial (SBT).6 The development of tachypnea (respiratory rate > 35 breaths/min), paradoxical motions of the abdomen or rib cage, hypoxemia, tachycardia, BP lability, diaphoresis, or severe anxiety indicate that the patient is not ready to be discontinuing from mechanical ventilatory support. The optimal duration of the SBT is unclear. Ely et al6 used a 2-h SBT, but the Spanish Lung Failure Collaborative Group reported that a 30-min trial is as effective as a 2-h trial in predicting weaning outcomes.5 A majority of patients will decompensate in the first few minutes of a SBT; therefore, close observation is critical.

The optimal mode of weaning remains controversial. Brochard et al8 prospectively compared weaning with T-piece, synchronized intermittent mandatory ventilation (SIMV), or pressure support ventilation (PSV) in 109 patients receiving mechanical ventilation (SIMV), or pressure support ventilation (PSV) in 100 patients receiving mechanical ventilation and concluded that PSV resulted in a significantly reduced duration on mechanical ventilatory support. Estaban et al9 reported that a once-daily t-piece, synchronized intermittent mandatory ventilation (PSV) in 109 patients receiving mechanical ventilatory support. Estaban et al9 reported that a once-daily SBT utilizing a T-piece resulted in quicker weaning times as compared to SIMV or PSV. Both studies concluded that SIMV is the least efficient mode of weaning.

In recent years, several studies have focused on how the weaning process is conducted and have concluded that a systematic approach is superior to the old physician “judgment and experience” model. Using a systematic approach has been shown to decrease the length of time on mechanical ventilatory support and total hospital costs but not duration of hospitalization.6,10,11 Standardization has been achieved by creating “wean teams”12 and weaning protocols. The use of protocols to wean patients reduces the length of time to weaning onset and the total duration of mechanical ventilatory support. Protocols have been successfully implemented in patients after cardiac surgery,10 and in medical and surgical ICUs.11,13 In this issue of CHEST (see page 236), Scheinhorn et al report on the efficacy of weaning protocols in the post-ICU setting.

Scheinhorn et al compare 252 consecutive patients (9,135 total ventilator days) admitted for weaning, with a control group of 238 historical control subjects. Using a 19-step therapist-implemented protocol resulted in a significant decrease in duration of mechanical ventilation. The time was reduced from a median time of 29 days in historical control subjects to 17 days for patients weaned using the therapist-implemented protocol (p < 0.001). There were no differences between the two groups in terms of outcome; a similar percentage was weaned in the protocol group (54.7%) vs in the historical group (58.4%). Mortality was similar between the two groups: 27.4% in the protocol group vs 30.7% in the historical group. Thus, the only impact of the protocol was in the speed of weaning and the resultant discontinuation of mechanical ventilatory support.

The authors’ results may not be easily replicated at other institutions. Barlow Respiratory Hospital specializes in the long-term care of patients with respiratory failure requiring prolonged mechanical ventilation. The authors have previously reported14 a 56% weaning success rate over an 8-year period in patients requiring > 21 days of ventilatory dependency, a rate that is higher than the rate that nonspecialized institutions have achieved. Furthermore, the 19-step protocol used in this study may be too cumbersome to be implemented at other less-specialized centers.

The successful use of a complex and elegant protocol refutes a common criticism of protocols, namely that they are “rigid” and result in “cookbook-style” medicine. While no single protocol can cover every possible patient or scenario, the utilization of protocols provides superior care for the majority of patients requiring mechanical ventilatory support. Protocols can and should be adapted to the needs of specific patient populations. The protocol devised by Scheinhorn and colleagues in fact replicates the style of weaning already in use at Barlow Respiratory Hospital during the historical control period. Its complexity reflects the difficulty of weaning patients requiring prolonged mechanical ventilation. For patients with acute respiratory failure, a two-step protocol of a simple 5-step daily screen followed by a spontaneous breathing trial, such as the protocol devised by Ely and colleagues,6 is easier to implement.

One of the difficulties in implementing protocols is resistance by health-care personnel to change from their current practice. This difficulty is demonstrated by Kollef and his colleagues,11 who had to devise three separate weaning protocols because they could not achieve a consensus among different physicians in the same institution despite the fact that the respiratory-care services were provided by a single respiratory-care service. They found that the mode
of weaning (SBT vs pressure support) was not as significant as to how the weaning was conducted (protocol vs physician directed). These results suggest that the lack of a systematic weaning strategy delays physicians’ recognition of their patients’ ability to breathe spontaneously and results in an overly conservative weaning management.

A collaborative multidisciplinary approach is crucial to ensure the implementation of a successful weaning protocol. Physicians, respiratory-care practitioners, nursing personnel, and key opinion leaders have to jointly agree on any protocol. Administrators must provide the necessary support to implement the protocol. “Inservicing” and intensive education of all personnel are required to achieve success. Protocols that reflect ongoing current clinical practices are more likely to achieve success than protocols that use the “new” method of weaning.

Despite the advances of the last decade, much research remains to be performed in order to optimize weaning of the more difficult patients such as the elderly,15 and of those with COPD. How can we best identify patients who, despite having a good ventilatory capacity, have impaired cough mechanisms and difficulty in clearing respiratory secretions? Does “early” tracheostomy for such patients result in earlier discontinuation of mechanical ventilatory support, decreased ICU and hospital utilization, and fewer complications? What role does noninvasive positive pressure ventilation have as a weaning adjunct in patients with a marginal cardiopulmonary reserve? Will newer modes of assisted ventilation such as volume-assured pressure support, automatic tube compensation, or proportional-assist ventilation result in more rapid weaning? Hopefully, the next decade will see further advances in the science of mechanical ventilatory management.

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The Urinary Antigen Test for the Diagnosis of Pneumococcal Pneumonia

Pneumonia, the leading cause of death in 1900, is currently the sixth-leading cause of death when combined with influenza, and necessitates hospitalization in > 455,000 noninstitutionalized adults in the United States each year, with approximately 43,000 deaths. Estimates suggest that 77% of pneumonia occurrences are treated in the outpatient setting; this would extrapolate to > 2 million pneumonia occurrences each year in the nonpediatric population. Approximately one sixth to one fifth of hospitalized adults are believed to have streptococcal pneumonia (pneumococcus), based on the assumption of a 25 to 30% bacteremic rate. Etiologic estimation of the outpatient adult population with