performed under moderate sedation or general anesthesia. However, the patient population studied in this previous report is different. These were patients with adenopathy not limited by size (mean size of lymph nodes sampled, 16 ± 3.6 mm; range, 8 to 32 mm), complete mediastinal and hilar lymph node screening was not performed, and fewer nodes were sampled (mean, 1.14 per patient). These three differences would lead to reduced time and increased simplicity of the procedure, making it more amenable to moderate sedation.

As more and more centers begin EBUS-TBNA programs, it is important that the procedure is performed in the correct environment and with realistic expectations of patients, operators, and equipment performance characteristics. If a consensus is reached that complete nodal staging is feasible and accurate with EBUS-TBNA, it may be more optimally performed under general anesthesia until the bronchoscopist feels comfortable in targeting these smaller lymph nodes in multiple stations in a conscious patient. We have recently described a safe option using propofol sedation with a laryngeal mask airway ventilation in the bronchoscopy suite that allows full access to the mediastinal lymph node stations. In contrast, EBUS-TBNA may be safely performed under conscious sedation in those patients with larger nodes without the requirement for complete lymph node staging.

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Response
To the Editor:

We thank Dr. Kennedy and his colleagues for their comments regarding the level of sedation during endobronchial ultrasound (EBUS) transbronchial needle aspiration (TBNA). The use of propofol and a laryngeal mask airway is certainly an additional option available to the bronchoscopist. It is important to remember, though, that there is currently no proof that any level of anesthesia deeper than moderate sedation is required for performing the procedure. This applies for the goal of the procedure (full staging vs targeted biopsy) as much as for the level of experience. Even though we agree that general anesthesia may make it easier especially for the relatively inexperienced operator, some issues require consideration before asking the anesthesiologist to provide deep sedation or general anesthesia for a patient.

Part of the advantage of EBUS TBNA is the ease and minimal patient impact compared with surgical staging, as well as the potential economic advantage. Deeper levels of sedation may partially negate these advantages by adding additional personnel and requiring operating room-type facilities in some institutions. An additional drawback to adding more resources that really are probably not required is the recent severe reimbursement cutback on the facility-based reimbursement (Hospital Outpatient Prospective Payment System) for EBUS TBNA procedures by the Centers for Medicare and Medicaid Services in January 2008. We need to choose the best approach for our patients but need to manage and minimize the resource use at the same time.

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Does Central Venous Pressure Predict Fluid Responsiveness?

To the Editor:

Marik and coauthors argue that the poor correlation between right atrial or central venous pressure (CVP) and indexes of fluid responsiveness after fluid administration limit the value of CVP measurement and conclude that CVP should not be a factor in fluid administration decisions. This appears to be at odds with the classic principles of circulatory physiology by Guyton and Hall, in which right atrial pressure is a key independent variable influencing both systemic venous return and right ventricular output. In these constructs, venous return may be independent of right atrial pressure at low pressures while right ventricular output may be independent of right atrial pressure at high pressures, in agreement with the review, but not in the middle.
pressure range. In addition, the failure to find correlations between CVP and indexes of fluid responsiveness might be influenced by ongoing fluid losses or gains that were not necessarily easily measurable. Finally, in many clinical situations, the success or failure of fluid resuscitation measures is not determined by preset goals in terms of cardiac output or other indexes of cardiovascular performance but by criteria such as pressor requirements or blood lactate concentrations. While the current recommendations guiding fluid replacement use CVP as only one of a number of clinical parameters to follow, and while dynamic parameters may have an increasing role in guiding fluid replacement, it may be premature to discard CVP measurements in ICU patients.

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Central Venous Pressure as Popular Resuscitation Surrogate

Not Totally Unjustified

To the Editor:

Mark and colleagues, using statistical analysis and data from controlled studies, show that isolated central venous pressure (CVP) measurements are a poor guide to the assessment of volume status and fluid responsiveness. They called attention to a common myth that CVP is a good guide to fluid management. It is an interesting reminder of related misconceptions in classical works of cardiovascular physiology. For instance, the experiments of Guyton and Starling are commonly misunderstood. The pump is commonly seen as the main orchestrator of output. Guyton’s experiments demonstrated the role of peripheral vasculature in controlling cardiac output. Physicians commonly mistake venous inflow to the atria as the determinant of left ventricular stroke volume. Starling, working on denervated hearts, showed that atrial filling and thus “ventricular wall stretch” was the primary determinant of stroke volume. Perhaps these misconceptions are a result of confusion between the cause and the consequence.

CVP is affected by a myriad of intrinsic and extrinsic factors including IV fluids, positioning, intrathoracic pressures, heart rate, contractility, and myocardial and venous compliance, among others. Further confusing the issue is discrepancy between normal physiology and disease state pathology. As an example,

sepsis alters total effective vascular compliance. Thus while CVP reflects mean right atrial pressure, it is not expected to show an independent correlation with effective circulatory blood volume.

Apparently, it is the intuitive simplicity of CVP that attracts a new learner as compared to the lack of receptiveness encountered with terms such as upstream and downstream resistance, flow limitation, and capacitance. The CVP-centric practice may also be widespread because it comes with convenience and there are no controlled studies that prove definite disadvantage related to the method used for fluid management. The 2008 Surviving Sepsis Campaign guidelines say “...recommend fluid resuscitation initially target a CVP of at least 8 mm Hg.” Justification of this statement is mostly based on a single study. The attempt at getting at least one of the determinants (CVP in this case) of cardiac output right, ie, achieving physiologic limits, may be a reasonable approach toward attempting to optimize perfusion in critically ill patients.

To conclude, we feel that the findings reported by Marik and colleagues are not unexpected. CVP remains meaningful along with the other parameters (BP, heart rate, urine output, extra heart sounds, cool extremities, fractional excretion of sodium) that are used by experienced clinicians to assess volume status.

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Response

To the Editor:

We thank Drs. Cole and Singh and colleagues for their thoughtful comments. We agree on most points. Decisions regarding fluid management are among the most difficult in clinical medicine in general and in the ICU in particular. We believe that this decision should be based on an indepth understanding of the disease process and treatment strategy, with a review of fluid balance, oxygenation index, urine output, chest radiograph, and renal function (and

1352 Correspondence