

## Preface



Jeffrey S. Vender, MD



Joseph W. Szokol, MD  
*Guest Editors*



Glenn S. Murphy, MD

The literature is replete with activities, monographs, and texts focused on the topic of monitoring. The term *monitor* is derived from the word *monere*, “to warn or remind.” Many investigators have extended this definition to include diagnostic tests (eg, troponin, electrolytes, hemoglobin) as methods for “monitoring” various organ functions. For the purpose of this monograph, we have elected to assess the topic in the context of the generation of data (diagnostic or monitoring) for the pathophysiologic assessment of the individual patient. In some articles, the focus is on specific monitoring tools, whereas other articles apply more generally to the assessment of specific organ functions.

The appropriate application of monitors or interpretation of diagnostic tests necessitates an understanding of the indications as well as the limitations of the tool. The sensitivity and specificity of the information will impact the clinical relevance, applicability, and value of the data. There remains a need for high-quality technological assessment that is uniformly and consistently defined and applied. What should be the determinant for the use of a new monitor or diagnostic test? Numerous metrics are applied in an attempt to ascertain the “value” of the new technology. Is a noninvasive test with less risk but less-reliable data a benefit? Should mortality be the metric for defining the generation of data?

For the past three decades, numerous investigators have tried to determine the value of pulmonary artery catheter (PAC) monitoring. Many of them have concluded that the PAC is of limited value in the patient populations studied and that there is limited benefit to warrant its use. A recent

editorial has called into question the conclusions of these studies relating to the methodologies and the metric used to determine PAC benefit, ie, mortality [1]. Monitors are not therapeutic agents! Antibiotics, antihypertensives, chemotherapy, and thrombolytics are employed to change mortality outcome. Mortality should not be the primary metric for technology assessment. The first level of assessment should be related to the data generated. Accuracy, precision, bias, specificity, and sensitivity are some of the metrics. Ease and ability to measure and interpret the data are important. Application and integration of the data in the management of the patient is key. If the cardiac output generated from a PAC doesn't change mortality, why should the same data derived from a noninvasive cardiac output technology impact outcome? Data are information to be used to generate knowledge. Knowledge, if appropriately interpreted and applied, is used to alter morbidity and mortality. Articles have continuously demonstrated deficiencies in the knowledge of clinicians in the understanding and application of information attained from various monitors or diagnostic tests.

Although not discussed in this issue, there is limited high-grade evidence-based medicine (EBM) supporting the role for pulse oximetry, yet expert opinion and clinical experience (not mortality measurements) have strongly supported its routine use and application as a standard of care in operating room anesthesia. Its limitations in not measuring fractional saturation are understood and compensated for in the interpretation of the data. Similarly, the growing use of transesophageal echocardiography as a diagnostic and monitoring tool in cardiac surgery is strongly supported by expert opinion but not by high-grade EBM demonstrating mortality benefit. Finally, even if there are appropriate understanding and reasonable EBM for a technology, they must be coupled with effective therapeutic interventions for the management of the pathophysiologic problem.

In this issue, we have attempted to assess several categories of monitoring. Space limitations, however, preclude addressing many of the technologies or diagnostics employed in clinical practice. We have selected topics of common applications (ECG, temperature), growing use (noninvasive cardiac function), clinical controversy (awareness), organ function (central nervous system, spine, renal, hepatic, coagulation), and value determination (technology assessment). Many of the articles reflect the opinions of the individual authors and referenced representation of the available information.

The inconsistencies of technology assessment and application, and the variability in the definition of value continue to be significant clinical dilemmas. It is our hope that with a continued effort at education, the more uniform use of EBM, and better guidelines/protocols for care, this problem can be reduced in the future. We must seek to define value as more than just acquisition cost or level of invasiveness. No matter how inexpensive, simple, or noninvasive a test or monitor is, if the information generated is not understood or appropriately applied, we cannot expect to derive a clinical

benefit. The management of an arrhythmia necessitates the correct electrocardiographic interpretation and therapeutic intervention. The diagnosis of a sinus-bradycardia secondary to hypoxemia is not necessarily an indication for atropine. We must continually strive to address the competency of the “carpenter” as well as the quality of the tool.

We would like to thank each of the contributing authors for their expertise and for their efforts at presenting the available information and providing perspective on their topics. A special thank you to Rachel Glover from Elsevier for her assistance and patience, to Anna Crawford for her diligence and efforts on our behalf, and to our colleagues in health care, who participate in the life-long learning process. We believe our patients will be the beneficiaries. Finally to our families, Bobbie, Todd, Kim, Pam, Kimberly, Elizabeth, William and Debbie, Lauren and Olivia, thank you. Your love, support, and understanding inspire us, enable us, and make it all worth doing.

Jeffrey S. Vender, MD  
*Feinberg School of Medicine  
Northwestern University  
2650 Ridge Avenue  
Evanston, IL 60201, USA*

*E-mail address: [jvender@enh.org](mailto:jvender@enh.org)*

Joseph W. Szokol, MD  
*Feinberg School of Medicine  
Northwestern University  
2650 Ridge Avenue  
Evanston, IL 60201, USA*

*E-mail address: [jszokol@enh.org](mailto:jszokol@enh.org)*

Glenn S. Murphy, MD  
*Feinberg School of Medicine  
Northwestern University  
2650 Ridge Avenue  
Evanston, IL 60201, USA*

*E-mail address: [gmurphy@enh.org](mailto:gmurphy@enh.org)*

## Reference

- [1] Vender JS. Pulmonary artery catheter utilization: the use, misuse, or abuse. *J Cardiothorac Vasc Anesth* 2006;20(3):295–9.