Of all the clinical competencies, the least understood are Systems-Based Practice and Practice-Based Learning and Improvement. With a shift to competency-based education and evaluation across the spectrum of surgical education and practice, a clear understanding of the power and utility of each competency is paramount. Health care operates as a complex adaptive system, with dynamics foreign to many health care professionals and educators. The adaptation and evolution of such a system is related directly to both the individual and the organizational learning of the agents within the system and knowledge management strategies. Far from being “difficult,” Systems-Based Practice and Practice-Based Learning form the heart of quality improvement initiatives and future productivity advances in health care. (J Surg 67:122-124. © 2010 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

COMPETENCIES: Systems-Based Practice, Practice Based Learning and Improvement

INTRODUCTION

Competency-based education has become the standard for undergraduate, graduate, and continuing medical education, as well as for initial and recredentialing in many hospitals. “Medical Knowledge,” “Patient Care,” “Professionalism,” and “Interpersonal and Communication Skills” are straightforward in their scope and understanding. However, what of “Systems-based Practice” and “Practice-based Learning and Improvement”? Numerous authors have articulated the difficulty of integrating these competencies into established concepts of medical education. Perhaps the difficulty and the solutions are dependent on a deeper understanding of ontology and epistemology, which are two disciplines not usually associated with the practice of medicine.

SYSTEMS-BASED PRACTICE

What exactly is the system on which the “practice” is based? The question is not trivial. As Snowden and Boone point out in their award-winning 2007 article in Harvard Business Review, effective responses will differ depending on whether the situation is simple, complicated, chaotic, or complex. The evidence points to health care operating as a Complex Adaptive System (CAS). A CAS is composed of multiple similar agents that interact in a dynamic manner and exhibit many distinctive characteristics. In simple and complicated systems, the agents (which can be individuals, organizations, or even ideas) are constrained by the system. Order is imposed on the agents by the system, and cause and effect can be recognized. An example of a simple system would be an airline preflight checklist. In this system, there is one recognized right way of proceeding. Likewise, in a complicated system, such as the Apollo Mission, the agents are ordered by the laws of physics. There may be many equally “right” ways of achieving the desired results. Cause and effect clearly operate within this system but may only be recognized by experts. In chaotic systems, there is no order, and cause and effect do not operate in a consistent fashion.

In a CAS, however, order is not imposed on the agents by the system, but “emerges” from constant interaction of the agents and the system. In this constant interaction, the agents and the system coevolve. Cause and effect operate but may be recognized only in hindsight (retrospective coherence). In the process of emergence, the total becomes more than the sum of the parts, in the same way that a team playing together can overcome an opponent’s individual abilities, and a perceptive coach will adapt his or her strategy based on the tempo of the game.

These qualities of self-organization, coevolution, and emergence, rather than directed, order all contribute to a high degree of adaptive capacity and resistance to perturbation in a CAS. When viewed in this light, current examples of competency in Systems-Based Practice, such as cost awareness and patient advocacy, seem to miss the real opportunities. Instead, education in complexity theory and the nature of the CAS could foster the enthusiastic adoption of the value-based model of
health care advocated by Porter and Teisberg,\textsuperscript{11,12} as well as a recognition of the importance of local starting conditions and the intertwining of structure and process in effective performance improvement.\textsuperscript{13} Ultimately, health care should be better because it is practiced in a system that is more than the sum of its parts (emergence).

Logan et al.\textsuperscript{16} provide an explanation as to why such a system approach is difficult for physicians to use. The organizational culture of medicine, like most other professions, is built on individual achievement, competition, responsibility, recognition, action, and reward. Although such activity is important, it should be viewed as a stage and not a destination. Any organization, including a health care organization, will be stunted in productivity until it can recognize and capitalize on the growth in productivity that emergent order will allow.

But how can an organization, be it a practice, a department, a hospital, or the total health care in a region, do this?

**PRACTICE-BASED LEARNING**

Currently, the competency of Practice-Based Learning in medicine is understood as primarily individual in scope and activity. That is not the case in the larger business community, in which learning and the accumulation and transfer of both tacit and explicit knowledge is viewed as one of the primary functions of the organization.\textsuperscript{15-17} It is not so much that the individual only contributes private knowledge to the organization. The organization itself catalyzes the accumulation of the tacit and explicit knowledge through such emergent order as “communities of practice.”\textsuperscript{24-26} Such communities of practice form an integral part of graduate medical education and have significant potential in continuing medical education.\textsuperscript{27} However, the trend for declining attendance at grand rounds should toll a warning bell that this effective means for explicit and tacit knowledge transfer is in danger.\textsuperscript{22-24} It remains to be determined whether newer digital tools can provide the same platform for effective interchange.\textsuperscript{25,26}

Understanding complexity theory can, particularly for the practicing physician, impart an appreciation of the importance of Systems-Based Practice and Practice-Based Learning in the modern practice of medicine and medicine’s overall role in the larger dimension of health care. The intertwining of these two competencies may allow the physician, who is committed to the improvement of health care to follow the advice of Paul Plsek, who recommended the following:

It is more helpful to think like a farmer than an engineer or architect in designing a health care system. Engineers and architects need to design every detail of a system. This approach is possible because the responses of the component parts are mechanical and, therefore, predictable. In contrast, the farmer knows that he or she can do only so much. The farmer uses knowledge and evidence from past experience, and desires an optimum crop. However, in the end, the farmer simply creates the conditions under which a good crop is possible. The outcome is an emergent property of the natural system and cannot be predicted in detail.\textsuperscript{27}

**REFERENCES**


