

Learning

Behavior Grounded in Experiences

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BEHAVIORAL modification is the branch of learning theory concerned with analysis and adaptation of human behavior. Psychologists Ivan Pavlov (1849–1936, Director, Institute of Experimental Medicine, St. Petersburg, Russia, 1891–1936) and John B. Watson, Ph.D. (1878–1958, Professor and Chair, Psychology, Johns Hopkins University, Baltimore, Maryland, 1908–1920), considered the founding fathers of modern behaviorism, along with B. F. Skinner, Ph.D. (1904–1990, Edgar Pierce Professor of Psychology, Harvard University, Cambridge, Massachusetts, 1958–1974), described the phenomenon of *stimulus–response* psychology; environmental events elicit specific learned repetitive behaviors.¹ Learning may be described as the act of acquiring new or modifying and reinforcing existing knowledge or behaviors.

As clinicians, we are faced with an ever-expanding body of knowledge and technological advancements that need to be learned, that is, integrated into our practice. How best to accomplish this?

Sathishkumar *et al.*² give us a clue to the answer as they discuss behavior modification in their study of intraoperative hypoglycemia management. The authors describe their institutional experience with a monitoring system that makes real-time data regarding a patient's blood glucose available to practitioners in the operating room. The behavior elicited (the learning) by this “reminder *stimulus*” (the experience) was measured by the authors observing the “treatment *response*” by the anesthesia provider.²

Providing a reminder stimulus and assessing its educational effect on clinical behavior is tremendously thought provoking. The authors propose that the simple act of making the data more available (the stimulus) elicits a more frequent response by clinicians who strive for euglycemia by



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Volumes have been written in exploration of the question: What is the true range for optimal perioperative glucose control? Despite years of ongoing research, this target has not yet been defined. Although we understand that perioperative euglycemia is important, we have no firm evidence-based limits to guide our treatment. Despite the contemporary climate of goal-directed therapies and ongoing research on the topic, a data-driven optimal glucose range continues to elude us. Such is the ambiguous craft of medicine.

When tied to a stimulus–response model of learning, the use of an audiovisual reminder for clinical management may become problematic. Will a behavior persist when the cue is not present? As clinical anesthesiologists, we are incredibly dependent on our monitoring technology, our apps, and our visual aids, for everything from crisis management to preoperative cardiac evaluation. There is an indisputable body of evidence confirming that these aids significantly improve patient care and patient safety. However, practice

administering insulin (the target behavior) in the setting of demonstrable hyperglycemia.

Behavioral scientist B. F. Skinner, Ph.D., defined the concept of “operant conditioning,” wherein the consequences of a given behavior influence the future occurrence of the behavior.¹ We all know the classic example: if a rat hits a bar and is rewarded by a morsel of kibble, the animal will hit the bar until its appetite is satiated. In medicine, the relation between clinical decision making and resultant behaviors and their outcomes is less clear. The expectation that clinical decisions (*i.e.*, behaviors) will be consistently rewarded by resultant positive outcomes is idealistic at best.

Perhaps, the most intriguing element of a recommendation to use this intraoperative behavior modification tool is that the target behavior itself is controversial.

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environments vary vastly, so what happens when one of our aids or reminders is not available? Will the management strategy persist in its absence?

Our current climate of algorithmic, data-driven decision making forces the issue: Where is the overlap between the art and the science of doctoring? What prompts us to take clinical action? More importantly, need all clinical decisions have a data-driven outcome? And when the jury's still out on a defined target goal—as it seems to be with many things, not just perioperative glucose control—how do we navigate ambiguity? How do we learn to make decisions that are best for our patients in the absence of clearly defined goals? By relying on an increasing number of external prompts, are we training a reactive generation of physicians whose aim is the execution of the task of protocol-driven patient care? Are ever-present reminders and algorithms that have advanced the practice of anesthesiology a double-edged sword?

How do we engage in behavioral modification strategies when behavior targets are ill defined? How do we teach and our learners become educated when what we do is not fully understood? This is where the lines blur between the art and science of medicine, and it is one of the elements that keeps the practice of anesthesiology and the education of its rising practitioners fascinating.

As we create learning environments for the next generation of physicians, it is incumbent upon us to teach not only the science and practice of medicine as we currently understand it but also to foster inquisitiveness in those who are developing their craft of physicianship. We must encourage the necessary commitment to life-long learning, that is, continuing to be exposed to life-long experiences that provide the stimuli to learn. Encouraging the next generation of anesthesiologists to administer half of the big syringe, all of the little syringe and turning the dial two clicks to the right is promoting rote performance, not providing learning. One could argue that the most important thing for a physician to learn is intellectual curiosity—a drive to understand the how and why of what we do. This inquisitiveness should be

accompanied by the characteristic of striving for improvement—for the patient, the physician, and the discipline.

A mentor once reflected that true leadership is defined by how someone approaches ambiguous situations. Being an anesthesiologist is no different: we must be leaders in the operating room and in the science of medicine. How we navigate the ambiguity that arises in many of the clinical situations we face may at times define us as doctors.

So What Should Prompt Us to Take Clinical Action?

Rather than targeted behavior modification, perhaps the authors' true "reveal" is to elicit thinking about addressing a clinical dilemma—in this case, perioperative glucose management. They do not propose a goal-directed behavior, but rather remind us in an age of escalating technology, multiple distracters, and alarm fatigue to *think like a doctor*. We must be able to make hard decisions with no clearly defined or guaranteed outcome, and we must do our best to navigate clinical uncertainty and hone the vigilance that is the mantra of our discipline. It reminds us to do what we already know: to *think*.

Competing Interests

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