VIEWPOINT

Is the Cognitive Cardiologist Obsolete?

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Current practice conditions are creating an existential threat for the cognitive cardiologist, and the resulting anxiety is contributing to physician burnout. Burnout, the emotional exhaustion that comes from a loss of meaning and purpose, affects more than half of physicians, according to recent surveys.[1] This in turn affects patient safety and has substantial economic costs.

Physicians are now spending more time with computers and less time with patients. They are pushed to provide greater productivity but are burdened with increasing administrative tasks, leaving little time for reflection and study. They have become homogenized into *providers*, a term that signifies how transactional medical care has become. All of these factors are dehumanizing. Professional identity—the narrative that we tell about ourselves—seems to be drowned out in the noise and confusion of today's rapidly changing and complex health care environment. To combat burnout, thinking physicians need to regain their sense of professional identity.

If I had to come up with 1 word to describe the professional identity of a physician, it would be knowledge. Cardiologists, for example, go through 4 years of medical school to learn the foundational knowledge of medicine and then 7 years of training to learn the experiential knowledge that equips them to practice their profession. Physicians work hard to gain knowledge but live in a time when it is discounted. Google searches make it easier to find quick answers to any question, giving the impression that knowledge is cheap and easily accessible. Combining knowledge with good judgment is wisdom, but philosophy, the love of wisdom, is often scorned as a navel-gazing activity that has no practical consequences. Physicians need to rearticulate their philosophy or mission statement, and that mission statement should contain the word knowledge.

Physicians use 2 types of knowledge: formal information abstracted from books and reviews, and experiential knowledge, or the know-how gained from practice. Several years ago, while writing a book on medical reasoning, I became intrigued by experiential knowledge and human intuition.[2] I went to the physicians' lounge of my hospital and asked colleagues, "How does a diagnosis pop into your head?" Many answered, "I don't know. It's like magic."

It ends up that it is not magic. Cognitive scientists can describe in detail the process of making a medical diagnosis, and their findings explain how physicians apply knowledge to make clinical decisions. Investigators have determined that experienced physicians diagnose patients through a process of hypothesis generation and then hypothesis testing, using a combination of intuitive and analytical thinking.[3-5] Cognitive psychologists have developed a dual process theory to explain how all decision makers use this combination of thinking styles.[6,7] To generate diagnostic possibilities, physicians use nonanalytical reasoning, or intuition (and if that does not work, they use something called abductive reasoning[2]).

Human intuition draws on experiential knowledge. Herbert Simon was the father of cognitive psychology, which includes behavioral economics. He won the Nobel Prize in Economics in 1978. Simon defined intuition this way: "The situation has provided a cue; this cue has given the expert access to information stored in memory, and the information provides the answer. Intuition is nothing more and nothing less than recognition."[8(p155)] Humans recognize objects because they have seen similar objects in the past, and cognitive psychologists use the term *exemplars* to describe objects that have been labeled and placed in long-term memory.[9] For nonanalytical reasoning, the recall is effortless. It is the upfront investment of careful observation and feedback that requires deliberate and effortful practice; for something to be memorable, it has to be meaningful. Understanding how humans gain and use experiential knowledge can help physicians in training reliably develop expert intuition.

In my view, intuition is a gift. Properly nurtured and calibrated, it can be an extraordinary human asset.

If physicians do not immediately recognize a diagnosis, then they revert to a form of reasoning that American philosopher Charles Saunders Peirce (who was best known for pragmatism) called abductive reasoning.[10] Peirce described abductive reasoning as reasoning toward the most plausible hypothesis.[10] Making a medical diagnosis using abductive reasoning is like looking at a chessboard in a midgame position. The disease, like the chess game, has already started, and the problem-solver is trying to figure out what has happened. One has to reason backward to imagine these possibilities. Abductive reasoning helps physicians generate hypotheses when the diagnostic possibilities are not intuitively obvious. It is the process that physicians use to generate a differential diagnosis.

After this, physicians test their diagnostic hypotheses. This requires the use of analytical reasoning and a thorough understanding of the operating characteristics of diagnostic tests. A full explanation of test interpretation is beyond the scope of this Viewpoint, but it is another fundamental part of the science of the art of diagnostic reasoning.[2]

I have come to the conclusion that the term *medical reasoning* may be something of a misnomer. The research shows that it is really just plain reasoning that physicians use—the same logic, probability, intuition, heuristics, and biases that everyone uses. The thing that makes medical reasoning special is specialized knowledge. Medical reasoning is not a skill that can be taught in the way a 1-hand tie can be. It is a natural human abil-

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ity that can be improved through habit and practice. If physicians in training and practice understand this, they can engage in deliberate practice and reflection and use their knowledge and expert intuition to make good judgments.

But this is the digital age of dizzyingly rapid innovation involving digital health, big data, precision health, and artificial intelligence. Disruptive innovations could revolutionize how clinical problems are solved. Is the cognitive cardiologist obsolete?

Innovation is great, but the hype about artificial intelligence creates near-term opportunity costs, crowding out resources that could be used for research and education to improve clinical decision-making right now.

Computers can make predictions and report them with overblown precision (often reporting risk with 3 decimal points), but ultimately humans have to judge how to use that information. Humans make mistakes, but computers cannot even begin to comprehend the moral and ethical dimensions of momentous human decisions. A computer is a powerful thing that can crunch data with brute force, but it lacks a human touch. Will artificial intelligence replace genuine human intelligence? Maybe, but I would say *caveat emptor* (let the buyer beware) and *primum non nocere* (first do no harm).

I have become less of a futurist and more of a humanist, with a deeper appreciation for the wisdom of our profession. Remembering the roots of our wisdom can give a renewed since of pride and a clear worldview that can help physicians regain a sense of professional identity and visualize the future of their profession. There is science in the art of medicine and practical wisdom that we need to rediscover. Reaffirming our mission to use knowledge for the betterment of patients can give us renewed confidence and clear a path through the clutter and complexity that confronts us.

Is the cognitive cardiologist obsolete? Not if we have the courage to regain our sense of professional identity by nurturing our love of knowledge. That is the cure for physician burnout.

ARTICLE INFORMATION

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