Snakes on a Dock

For the past decade, I have been thinking about the way our minds make judgments. It started with research on how financial and other conflicts of interest affect published conclusions1 and recommendations. My focus then moved onto diagnostic reasoning and metacognition (thinking about thinking). In the last 2 years, I have begun to think about how to teach cognitive processes to medical students, residents, and practicing physicians.2 These efforts involve explaining theoretical constructs like prospect theory3 and common biases that introduce error (anchoring, early closure, availability, ego, etc4). But frankly, when I discuss these topics with trainees, I can see their eyes glaze over and their attention wander back to the pressing patient care issues of the day. These concepts are simply too abstract to resonate with most physicians.

Louise Aronson recently wrote about the power of the story to effectively communicate ideas.5 Her essay described a radio call-in show where the guest was a highly accomplished clinician-scientist who deftly discussed recent studies that challenged current beliefs and practices about mammography screening. Her articulate arguments were completely undermined when a caller described how her 42-year-old sister was likely saved from breast cancer death by a screening mammogram. Aronson suggested that the best way to proceed at that point might have been to provide the following counteranecdote: the story of a friend who underwent 22 biopsies and mutilating surgery after a false-positive mammogram. In the spirit of her essay, I tell this story as a teaching tool to suggest how we all might improve our clinical reasoning.

Our family vacation home is situated on a small bay on Lake Muskoka, near the town of Bala, Ontario. Our cottage is a peaceful retreat from our lives in the city. We treasure the times we spend there with our children and grandchildren and the memories those occasions create. However, maintaining a country property also comes with challenges, frequently caused by weather and wildlife. Perhaps the most vexing intrusion on the daily peace and calm are the ducks and geese that use the docks, the deck up at the cottage. I strategically placed the new pad with the folding lounge chairs, and an umbrella, and of course the snakes to keep the birds away. When we returned the next weekend, we were surprised to see that the pad had blown off the dock, the chairs were at the bottom of the lake, and the umbrella was hanging in the water. There had been a wind storm during the week causing the disruption. We righted the umbrella, dove to the bottom of the lake to retrieve the chairs (it was only about 5 feet deep), and returned everything to its place. No real harm was done. But the snakes were missing. And a few days later, we had visitors on our dock—3 chubby ducks sitting on the end. I knew what was coming next.

To find the snakes, I dove into the water to search the bottom. I swam under the dock and covered an area that was about 400 square feet in the direction of where the wind had blown the other items off the dock. The bottom is sandy and visualization is good, but the snakes were dark and likely not easy to see. My wife went back to the store to buy more snakes, but the old model was out of stock. The new snakes were less frightening—they were small and curled up, and their heads and tongues were less menacing. We did have one of the originals left from the dock up at the cottage. I strategically placed the new snakes and the single old one on the end of the dock, but the next morning we had … lots more duck crap. This meant war—I needed to find my snakes!

More determined than ever, I devised an experiment to help me find them. I entered the lake with the one remaining old snake and lowered it into the water to see what it would look like on the bottom when it sank. I hoped that this visual clue would help. But as I held the snake under the water and then released it from my grip, something remarkable happened that completely changed my search strategy. The snake didn’t sink to the bottom; it remained old snake and lowered it into the water to see what it would look like on the bottom when it sank. I hoped that this visual clue would help. But as I held the snake under the water and then released it from my grip, something remarkable happened that completely changed my search strategy. The snake didn’t sink to the bottom; it searched for Toronto at the end of the weekend. In order to secure it from blowing off the dock, we covered the pad with the folding lounge chairs, and an umbrella, and of course the snakes to keep the birds away. When we returned the next weekend, we were surprised to see that the pad had blown off the dock, the chairs were at the bottom of the lake, and the umbrella was hanging in the water. There had been a wind storm during the week causing the disruption. We righted the umbrella, dove to the bottom of the lake to retrieve the chairs (it was only about 5 feet deep), and returned everything to its place. No real harm was done. But the snakes were missing. And a few days later, we had visitors on our dock—3 chubby ducks sitting on the end. I knew what was coming next.

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premise. Because the chairs had sunk to the bottom, I assumed the snakes were there too. Instead I realized that they likely floated into the foliage at the water’s edge. Out came the kayak, and I initiated a search of the shore line. About 10 feet from the dock, I saw the first forked red tongue. It looked so real I thought it was alive. It was our friend, the original plastic snake. The other 3 were right behind it buried in the green leafy plants that line the bay. The old snakes took up their positions on the dock, and like magic, the ducks never returned.

When I reflect on the difficult diagnoses I have observed over the 40-year course of my clinical career, I recall many floating snakes. One patient presented with fever and right lower-quadrant pain. Just as I assumed that because the chairs were on the bottom of the lake so too must the snakes be there, his clinicians assumed his pathology must be in the same location as his pain. He underwent an appendectomy, but they found a normal appendix. In fact, his pain was referred from a paraspinal abscess that grew and was seen when a simple abdominal x-ray was performed a month later. Another patient presented with respiratory failure from vocal cords that did not open, leading to a search for the neurological cause of the paralysis. A subsequent physician, starting over by performing a complete physical examination, noted ulnar deviation of the hands, a classic finding in rheumatoid arthritis. This observation led to the correct diagnosis: rheumatoid involvement of the cricoaryte- noid joint causing fixation (not paralysis) of his vocal cords. A third patient presented repeatedly to emergency departments with severe vomiting and right upper-quadrant pain. Each time she was told “all tests were normal” except for a very mild thickening in her common bile duct found on ultrasound that was likely a normal variant. At her next emergency visit, her physician reviewed the new image with the radiologist and together they compared all the ultrasound images over time. The same finding was present each time, and the radiologist concluded there must be pathology. Liver magnetic resonance imaging subsequently showed the entire biliary tree was in fact abnormally thickened, leading to a diagnosis of autoimmune cholangitis. Finally, there was a patient on a psychiatry ward who told the staff that she had left the hospital and purchased and consumed an entire bottle of acetaminophen pills. However, the lab reported that her acetaminophen level was undetectable. Later that night, the medical resident who had been consulted noted that her serum aspartate aminotransferase had doubled (yet still remained below the upper limit of normal). He reordered the acetaminophen level, which was now in the toxic range. It turned out that the equipment used to perform the assays earlier in the day was faulty, and the previous measure was an error. In each of these cases, the clinicians reexamined a key assumption and did “an experiment” (ordered a new abdominal x-ray, repeated a complete physical exam, compared all images, remeasured the acetaminophen level) to help them “see the snakes at the bottom of the lake.” In each case, the snakes floated, motivating the clinicians to use their kayaks to find the answers on the shore.

Just as Aronson’s story helped imprint the concept of harms that can result from screening mammography, perhaps the symbolism of this story can help teach physicians the following practice. When faced with a difficult and ongoing diagnostic dilemma, refocus on the key assumptions that have driven the strategy to search for the “snakes.” Start by dividing the findings into those that are based on facts and those that are based on inferences derived from those facts. Devise an experiment to see if those inferences are indeed true, like holding the snakes under the water to see what they look like on the bottom of the lake. By remembering this story, perhaps you too will find that your snakes float, and you will be on your way to finding them (and the right diagnosis) too.

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