

# The Mechanics of Reasoning

**S**TUDENTS LEARN REASONING BY LISTENING TO OTHERS REASON. We teachers hope that clinical reasoning is on full display in clinics and wards, but frequently it is not. In the increasingly hectic clinical and educational environment, it is less common for the trainee to hear a more experienced clinician's distinct line of thought from the patient's first concern to conclusion. Moreover, since reasoning transpires largely at the subconscious level, it can be difficult for experienced physicians to slow down and unpack their internal dialogue. Students are left to pick up reasoning in bits and pieces and figure out their own way to "connect the dots" when faced with a patient.

Educators and course directors increasingly struggle to place students with preceptors who allow learners to join them regularly, evince great joy in their job, and model high-level knowledge and reasoning. Technology and media are increasingly common salves for our educational woes, but where can trainees find the virtual preceptors in the digital age? A search for "master clinician" on YouTube triggers an interesting mix of drumming and dentistry videos. Television's *Scrubs* and *Grey's Anatomy* focus mostly on the interpersonal (interpret as you may) aspects of being a physician. *House M.D.* certainly is a cognitive tour de force, but few can endorse Hugh Laurie's character as the "whole package" for trainees to emulate.

Fortunately, media's finest display of clinical reasoning has been around since 1977. This weekly show spotlights two master clinicians. They are presented every conceivable problem related to their specialty. They solve cases by history alone. They laugh a lot and clearly enjoy what they are doing. And not only do they demonstrate superb diagnostic acumen, but they also model many of the ACGME core competencies. This is not a medical program, but rather National Public Radio's *Car Talk*.

This weekly radio broadcast is hosted by two experienced mechanics and comical brothers, Tom and Ray Magliozzi. Listeners from across the United States call in to ask about car-related problems that a mechanic could reasonably be expected to solve ("The sound when I go downhill is kind of like two rocks being ground inside a Cuisinart.") to issues that are more tangential ("Can I drive in the car pool lane if I'm alone in my car but pregnant?"). Occasionally, the hosts have to act as mediators in car-related disputes, eg, "My husband is teaching the kids to hot-wire the family minivan; I think it's a bad idea. Who's right?"

The cognitive task of the mechanic is virtually identical to that of the physician: both use history, examination, and

tests to diagnose and repair a complicated machine in the context of a human relationship. Students who listen to *Car Talk* can appreciate the fundamentals of problem solving and reasoning that serve both the mechanic and the physician. Based on an admittedly unsystematic qualitative analysis of years of *Car Talk* programs, I will share some of the key elements of clinical reasoning that students can observe (and teachers can highlight).

**Building Rapport.** Even before the chief complaint (or concern) is issued, a relationship is formed with the caller. Simple questions or observations about their name, hometown, or occupation ("What exactly does a beer ambassador do?") form an immediate connection. Frequently, this information proves useful in formulating the final diagnosis and prescription. The brothers sometimes make light of the make and model of their patient (eg, AMC Gremlin), but this is ill-advised for physicians.

**Hypothesis Generation and Selection.** Between laughs and tangential anecdotes about their own misadventures, the hosts invoke multiple diagnoses based on the chief complaint and history and then verify or reject those hypotheses by further questioning. The banter between the two hosts puts this process, which is usually concealed in the subconscious of the individual physician, on display.

**Questions Are Driven by Solutions.** The brothers' questions for the caller are usually linked to a possible diagnosis. A woman recently reported receiving a shock every time her husband kissed her inside the car. Acknowledging their newlywed status, Ray still asked, "Did you recently get new tires?" Answer: Yes. Explanation: some tires cause static electricity buildup. Students can see how they must know the disease (its signs and symptoms) well enough to ask the right questions to detect the disease. That insight, however circular, makes explicit that experience and study provide the extensive menu of potential solutions (*illness scripts* in clinical reasoning jargon) that drives efficient information gathering. This gives some structure to our often vague instructions to report only "pertinent" information related to a presenting problem.

**Problem Representation.** The hosts translate the jumble of information the caller provides (history of present illness) into a succinct and meaningful statement that allows them to search their mental files for solutions ("Sounds like your radio loses power every time you abruptly decelerate on country roads. That can only be one of three things."). Students should be on the lookout for this critical step in

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clinical reasoning called *problem representation*—without this, clinicians cannot form a bridge between the patient's words and their own knowledge and experience.

**Problem-Solving Strategies.** The brothers alternate between the dual modes of reasoning—pattern recognition and analytical reasoning—throughout the show. Students can appreciate how many problems are solved by familiarity (eg, having seen new tires cause static electricity in the past), but that reversion to analytical reasoning always remains in the experts' toolbox when challenging or novel situations arise. And in a laudable display of humility, the hosts are never afraid to say, "I don't know." When this happens, one of the brothers may spin the *Car Talk* Wheel of Misfortune<sup>1</sup> to help choose a course of action, another practice best avoided by physicians in front of patients.

**Prioritized Differential Diagnosis.** After dispensing some form of marital, parental, or other life advice, the hosts settle on the most likely diagnosis but never fail to mention what could be most the most serious issue that requires urgent attention (eg, problem with steering and brakes). This combination, in a nutshell, is the final synthesis we hope to hear from students when they assess patients. Trainees can also observe in the hosts' concluding remarks to a caller the same nuanced combination of confidence, reassurance, and caution that physicians often must convey to patients, eg, "I don't think the sparks are a big deal, but I wouldn't wear any rayon clothes while driving."

**Second Opinions.** While the second opinion is disappearing in medical practice, this important safeguard against premature closure (settling on a diagnosis too early) is built into the *Car Talk* diagnostic process. Many callers are reaching out to the hosts to query the diagnosis or repair proposed by the car dealership, their local mechanic, or their father ("My dad said that duct tape should last for the entire road trip, but I'm a little concerned."). During their own deliberations, one brother will frequently say to the other, "I know where you're going with this, and I don't [or do] like it." This repartee reveals capacity for discussion and discord in the diagnostic process and helps students appreciate that there is more than one reasonable way to proceed in complex decision making.

**Quality Improvement.** The development of professional expertise requires regular feedback on our judgment. In their regular "Stump the Chumps" feature, the hosts model practice-based learning by contacting a previous caller to discover if they gave sound advice or not.<sup>2</sup> (Their success rate

of 71%<sup>3</sup> affirms the medical aphorism that history alone makes the diagnosis 75% of the time.<sup>4</sup>)

Of course, students can only develop true competence from experiences anchored in the context and the content of the clinical environment. *Car Talk*, like most forms of technology and media, offers advantages and conveniences that supplement those trainee-patient-teacher interactions. First, podcasting makes the lessons of reasoning available anytime, anywhere to the student. Second, in a given afternoon in clinic or admitting cycle on the wards, we are pleased to have the student see one or two undifferentiated cases where their own thinking and that of their teachers can be put to the test. *Car Talk* presents six or more problem-solving encounters in one hour each week. Finally, the disentanglement from medical facts allows the student of reasoning to observe the process rather than obsess over the content (consider if this were a medical call-in show *Body Talk*: "My husband makes this terrible noise . . .").

Clinical reasoning remains a central skill of the successful clinician. Without ever giving it any thought, most students and physicians come to reason adequately using the same inborn neural circuitry we use to reason through life's myriad situations that require us to diagnose and act. But if we want to develop students (and teachers) of the reasoning process who view it as a procedure worthy of improvement and mastery (the same way we hope to refine our communication skills or lumbar puncture technique), it is essential to outline the cognitive steps and the interpersonal dimensions that lead to success in eliciting, framing, and then solving medical problems. Helping trainees understand how physicians think is serious business, but there's room for a few laughs along the way.

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