

CHAPTER I

Flesh-and-Blood Decision-Making

ON A SWELTERING MORNING in June 1976, I put on a starched white coat, placed a stethoscope in my black bag, and checked for the third time in the mirror that my tie was correctly knotted. Despite the heat, I walked briskly along Cambridge Street to the entrance of the Massachusetts General Hospital. This was the long-awaited moment, my first day of internship — the end of play-acting as a doctor, the start of being a real one. My medical school classmates and I had spent the first two years in lecture halls and in laboratories, learning anatomy, physiology, pharmacology, and pathology from textbooks and manuals, using microscopes and petri dishes to perform experiments. The following two years, we learned at the bedside. We were taught how to organize a patient's history: his chief complaint, associated symptoms, past medical history, relevant social data, past and current therapies. Then we were instructed in how to examine people: listening for normal and abnormal heart sounds; palpating the liver and spleen; checking pulses in the neck, arms, and legs; observing the contour of the nerve and splay of the vessels in the retina. At each step we were

closely supervised, our hands firmly held by our mentors, the attending physicians.

Throughout those four years of medical school, I was an intense, driven student, gripped by the belief that I had to learn every fact and detail so that I might one day take responsibility for a patient's life. I sat in the front row in the lecture hall and hardly moved my head, nearly catatonic with concentration. During my clinical courses in internal medicine, surgery, pediatrics, obstetrics and gynecology, I assumed a similarly focused posture. Determined to retain everything, I scribbled copious notes during lectures and after bedside rounds. Each night, I copied those notes onto index cards that I arranged on my desk according to subject. On weekends, I would try to memorize them. My goal was to store an encyclopedia in my mind, so that when I met a patient, I could open the mental book and find the correct diagnosis and treatment.

The new interns gathered in a conference room in the Bulfinch Building of the hospital. The Bulfinch is an elegant gray granite structure with eight Ionic columns and floor-to-ceiling windows, dating from 1823. In this building is the famed Ether Dome, the amphitheater where the anesthetic ether was first demonstrated in 1846. In 1976, the Bulfinch Building still housed open wards with nearly two dozen patients in a single cavernous room, each bed separated by a flimsy curtain.

We were greeted by the chairman of medicine, Alexander Leaf. His remarks were brief — he told us that as interns we had the privilege to both learn and serve. Though he spoke in a near whisper, what we heard was loud and clear: the internship program at the MGH was highly selective, and great things were expected of us during our careers in medicine. Then the chief resident handed out each intern's schedule.

There were three clinical services, Bulfinch, Baker, and Phillips,

and over the ensuing twelve months we would rotate through all of them. Each clinical service was located in a separate building, and together the three buildings mirrored the class structure of America. The open wards in Bulfinch served people who had no private physician, mainly indigent Italians from the North End and Irish from Charlestown and Chelsea. Interns and residents took a fierce pride in caring for those on the Bulfinch wards, who were “their own” patients. The Baker Building housed the “semi-private” patients, two or three to a room, working- and middle-class people with insurance. The “private” service was in the Phillips House, a handsome edifice rising some eleven stories with views of the Charles River; each room was either a single or a suite, and the suites were rumored to have accommodated valets and maids in times past. The very wealthy were admitted to the Phillips House by a select group of personal physicians, many of whom had offices at the foot of Beacon Hill and were themselves Boston Brahmins.

I began on the Baker service. Our team was composed of two interns and one resident. After the meeting with Dr. Leaf, the three of us immediately went to the floor and settled in with a stack of patient charts. The resident divided our charges into three groups, assigning the sickest to himself.

Each of us was on call every third night, and my turn began that first evening. We would be on call alone, responsible for all of the patients on the floor as well as any new admissions. At seven the following morning, we would meet and review what had happened overnight. “Remember, be an ironman and hold the fort,” the resident said to me, the clichés offered only half jokingly. Interns were to ask for backup only in the most dire circumstances. “You can page me if you really need me,” the resident added, “but I’ll be home sleeping, since I was on call last night.”

I touched my left jacket pocket and felt a pack of my index

cards from medical school. The cards, I told myself, would provide the ballast to keep me afloat alone. I spent the better part of the day reading my patients' charts and then introducing myself to them. The knot in my stomach gradually loosened. But it tightened again when my fellow intern and supervising resident signed out their patients, alerting me to problems I might encounter on call.

A crepuscular quiet settled over the Baker. There were still a few patients I had not met. I went to room 632, checked the name on the door against my list, and knocked. A voice said, "Enter."

"Good evening, Mr. Morgan. I am Doctor Groopman, your new intern." The appellation "Doctor Groopman" still sounded strange to me, but it was imprinted on the nameplate pinned to my jacket.

William Morgan was described in his chart as "a 66-year-old African-American man" with hypertension that was difficult to control with medications. He had been admitted to the hospital two days earlier with chest pains. I called up from my mental encyclopedia the fact that African Americans have a high incidence of hypertension, which could be complicated by cardiac enlargement and kidney failure. His initial ER evaluation and subsequent blood tests and electrocardiogram did not point to angina, pain from coronary artery blockage. Mr. Morgan shook my hand firmly and grinned. "First day, huh?"

I nodded. "I saw in your chart that you're a letter carrier," I said. "My grandfather worked in the post office too."

"Carrier?"

"No, he sorted mail and sold stamps."

William Morgan told me that he had started out that way, but was a "restless type" and felt better working outside than inside, even in the worst weather.

"I know what you mean," I said, thinking that right now I too

would rather be outside than inside — alone, in charge of a floor of sick people. I updated Mr. Morgan on the x-ray tests done earlier in the day. A GI series showed no abnormality in his esophagus or stomach.

“That’s good to hear.”

I was about to say goodbye when Mr. Morgan shot upright in bed. His eyes widened. His jaw fell slack. His chest began to heave violently.

“What’s wrong, Mr. Morgan?”

He shook his head, unable to speak, desperately taking in breaths.

I tried to think but couldn’t. The encyclopedia had vanished. My palms became moist, my throat dry. I couldn’t move. My feet felt as if they were fixed to the floor.

“This man seems to be in distress,” a deep voice said.

I spun around. Behind me was a man in his forties, with short black hair, dark eyes, and a handlebar mustache. “John Burnside,” he said. “I trained here a number of years ago and was by to see some old friends. I’m a cardiologist in Virginia.”

With his handlebar mustache and trimmed hair, Burnside looked like a figure from the Civil War. I remembered that a famous general of that name had fought in that conflict. Burnside deftly took the stethoscope from my pocket and placed it over Mr. Morgan’s chest. After a few short seconds, he held the bell of the instrument over Mr. Morgan’s heart and then removed the earpieces from his ears. “Here, listen.”

I heard something that sounded like a spigot opened full blast, then closed for a moment, and opened again, the pattern repeated over and over. “This gentleman just tore through his aortic valve,” Burnside said. “He needs the services of a cardiac surgeon. Pronto.”

Dr. Burnside stayed with Mr. Morgan while I raced to find a nurse. She told another nurse to stat page the surgery team and

ran back with me, the resuscitation cart in tow. Dr. Burnside quickly inserted an airway through Mr. Morgan's mouth and the nurse began to pump oxygen via an ambu bag. Other nurses arrived. The cardiac surgery resident appeared. Together we rushed Mr. Morgan to the OR. Dr. Burnside said goodbye. I thanked him.

I returned to the Baker and sat for several minutes at the nurses' station. I was in a daze. The event seemed surreal — enjoying a first conversation with one of my patients, then, like an earthquake, Mr. Morgan's sudden upheaval, then the *deus ex machina* appearance of Dr. Burnside. I felt the weight of the cards in my pocket. Straight A's when I was a student, play-acting. Now, in the real world, I gave myself an F.

I forced myself to go about my chores through the rest of the evening: checking the potassium level of a patient with diarrhea; adjusting the insulin dose for a diabetic whose blood sugar was too high; ordering another two units of blood to be transfused for an elderly woman with anemia. Between each task, my thoughts returned to what had happened with Mr. Morgan. In medical school physiology lectures I learned the relevant formulas for cardiac output and gas exchange in the lungs; in pharmacology class, the actions of various medications on heart muscle. On bedside rounds, I had spent hours listening to the sounds of patients' hearts. But I had no idea what I was hearing in Mr. Morgan's chest, or what to do about it. My high grades were meaningless. The MGH selection committee had made a mistake offering me an internship. After all the years of preparation, I ended up with an empty head and my feet fixed to the floor.

Mercifully, the rest of the night was uneventful. Three patients were admitted, but none was very ill, and most of their evaluation had been completed in the ER before they were transferred upstairs to the Baker service. Around 3 A.M., I called the OR. I heard

that Mr. Morgan had survived open heart surgery, a prosthetic valve firmly in place. My shoulders slumped in relief.

That first night of internship showed me that I needed to think differently from how I had learned to think in medical school — indeed, differently from the way I had ever thought seriously in my life. This was despite my having met patients like Mr. Morgan before. During medical school we had studied what are called paper cases, patients in the form of written data. The attending physician would hand out a detailed description that would begin something like this: “A 66-year-old African-American retired postal worker with a history of poorly controlled hypertension presented to the hospital with the chief complaint of worsening chest pain over several weeks. Initial evaluation ruled out angina. On the third day of the hospital stay, he developed acute respiratory distress.” The attending would then give more details on Mr. Morgan — the range of his elevated blood pressure, the medications that failed to control it in the past — and lead us through a systematic analysis of the problem. First, the chief complaint, here acute shortness of breath. Second, the history of the present illness, angina having been ruled out. Third, the medical history, notably poorly controlled hypertension. Fourth, the physical examination. At that point, the attending would elaborate on what was heard through the stethoscope: breath sounds described as “rales,” indicating fluid in the lungs; another heart sound, an “S₃,” indicating cardiac failure; and the crescendo/decrecendo murmur of aortic regurgitation — blood being pumped out through the left ventricle into the aorta but then flowing back into the heart.

Hands would shoot up in the classroom as students offered their ideas about what was wrong. Our mentor would take these hypotheses and write them on the board, creating a “differential

diagnosis,” a laundry list of possible causes of sudden shortness of breath in a man with this medical history and these physical findings. From this differential diagnosis, he would point to the right answer and then enumerate the measures taken to restore respiratory and cardiac function until the patient was placed on heart-lung bypass in the OR.

In the last two years of medical school, when we saw patients on bedside rounds, the attending physician modeled a similar intellectual strategy for us. He would lead us through a calm, deliberate, and linear analysis of the clinical information and how to treat the malady.

As Robert Hamm of the Institute of Cognitive Science at the University of Colorado, Boulder, contends, the irony is that our mentor, the senior attending physician, does not think this way when he actually encounters a patient like William Morgan. At such moments, Hamm writes, it is not evident that any “reasoning” is being used at all. Studies show that while it usually takes twenty to thirty minutes in a didactic exercise for the senior doctor and students to arrive at a working diagnosis, an expert clinician typically forms a notion of what is wrong with the patient within twenty seconds. According to Hamm and other researchers on physician cognition, if I had asked John Burnside what was going on in his head, he would have been hard-pressed to describe it. It simply happened too fast.

Dr. Pat Croskerry, an emergency room doctor in Halifax, Nova Scotia, began his academic career as a developmental psychologist and now studies physician cognition. He explained to me that “flesh-and-blood decision-making” pivots on what is called pattern recognition. The key cues to a patient’s problem — whether from the medical history, physical examination, x-ray studies, or laboratory tests — coalesce into a pattern that the physician identifies as a specific disease or condition. Pattern recognition, Croskerry told me, “reflects an immediacy of perception.” It occurs

within seconds, largely without any conscious analysis; it draws most heavily on the doctor's visual appraisal of the patient. And it does not occur by a linear, step-by-step combining of cues. The mind acts like a magnet, pulling in the cues from all directions.

On that first night of internship I also learned that thinking is inseparable from acting. Donald A. Schön, a professor at the Massachusetts Institute of Technology, studied types of cognition in various professions. Medicine, he contended, involves "thought-in-action," unlike, say, economics. Economists work by first assembling a large body of data, then analyzing it meticulously, and only after the assembly and analysis do they draw conclusions and make recommendations. Physicians at the bedside do not collect a great deal of data and then leisurely generate hypotheses about possible diagnoses. Rather, physicians begin to think of diagnoses from the first moment they meet a patient. Even as they say hello they take the person's measure, registering his pallor or ruddiness, the tilt of his head, the movement of his eyes and mouth, the way he sits down or stands up, the timbre of his voice, the depth of his breathing. Their notions of what is wrong continue to evolve as they peer into the eyes, listen to the heart, press on the liver, inspect the initial set of x-rays. Research shows that most doctors quickly come up with two or three possible diagnoses from the outset of meeting a patient — a few talented ones can juggle four or five in their minds. All develop their hypotheses from a very incomplete body of information. To do this, doctors use shortcuts. These are called heuristics.

Croskerry said that heuristics flourish when a physician assesses unfamiliar patients, or when he must work quickly, or when his technological resources are limited. Shortcuts are the doctor's response to the uncertainty and demands of the situation. They are the essential working tools of clinical medicine, where a doctor must combine thought and action. As Croskerry puts it, they are "fast and frugal," the core of flesh-and-blood decision-making.

The problem is that medical schools do not teach shortcuts. In fact, you are discouraged from using them, since they deviate sharply from the didactic exercises in classrooms or on bedside rounds conducted by the attending physician. In our paper case of a patient like Mr. Morgan, after we systematically analyzed all the components of his problem, we would be asked to reflect on the underlying basic science of acute heart failure. An animated discussion of the contractile changes in the heart's muscle and the pressure fluxes across the torn valve would follow. Of course, a doctor must know physiology and pathology and pharmacology. But he should also be schooled in heuristics — in the power and necessity of shortcuts, and in their pitfalls and dangers.

Further on in this book, we will explore how heuristics serve as the foundation of all mature medical thinking, how they can save lives, and how they also can lead to grave errors in clinical decision-making. Importantly, the right shortcuts have to be employed at an optimal emotional temperature. The doctor has to be aware of which heuristics he is using — and how his inner feelings may influence them.

The effects of a doctor's inner feelings on his thinking get short shrift in medical training and in research on decision-making. "Most people assume that medical decision-making is an objective and rational process, free from the intrusion of emotion," Pat Croskerry said to me. Yet the opposite is true. The physician's internal state, his state of tension, enters into and strongly influences his clinical judgments and actions. Croskerry spoke of the Yerkes-Dodson law on task performance, developed by psychologists studying psychomotor skill. It is expressed as a bell-shaped curve.

The vertical axis represents a person's "performance," the horizontal axis his level of "arousal" — meaning the level of tension, driven by adrenaline and other stress-related chemicals. Before the ascent, at the base of the bell, there is very little, if any, tension.

“You want to be just at the peak, where you think and perform the best,” Croskerry said. This point he termed “productive anxiety,” an optimum level of tension and anxiety that sharply focuses the mind and triggers quick reactions.

Thirty years after that harrowing episode in Mr. Morgan’s room, I watched three medical students in similarly extreme anxiety. They were caring for a man in his forties named Stan, who had come to the emergency room with severe abdominal pain. He had a low fever and his blood pressure was falling. As the students began to examine him, he cried out to them to alleviate his suffering. “Please,” Stan demanded, “please stop the pain.” The students looked frantic. One picked up a syringe with morphine and delivered it through an intravenous line in Stan’s arm. Within a minute, Stan stopped breathing. The students called for help performing cardiopulmonary resuscitation.

Fortunately, Stan is not a living patient, despite the pliant texture of his skin, the authentic timbre of his voice, and the palpable pulse in his wrists. He is a high-tech mannequin. He can be programmed to show either normal physiology or the signs of various diseases, and to respond authentically to treatments. Dr. Nancy Oriol, the dean of students at Harvard Medical School, said the three students that day were like all the other novices who had cared for Stan: every group missed the correct diagnosis. Stan’s blood pressure was falling because he had an acute inflammation of the pancreas. The students failed to give him the right kind of therapy for this condition and did not order the correct type and amounts of intravenous fluids to restore his blood pressure. In response to Stan’s cries of pain and pleas for action, several students injected a possibly lethal dose of morphine. “What happened to you, Jerry, in Mr. Morgan’s room is what happened to the students with Stan,” Dr. Oriol said. “It is as if everything that you learn in school is erased.”

Simulations with Stan are designed to act as a bridge between analytical learning in classrooms and pattern recognition performed at the peak of the Yerkes-Dodson curve. But, as Oriol and others readily admit, there still will come that first moment when the novice can no longer be a novice, when he is the one who must take responsibility for a living, breathing patient in need.

Extreme arousal happens not only during the first encounter with a William Morgan, but throughout internship and residency. During this training, young doctors gradually learn how to move themselves back from the edge of the Yerkes-Dodson curve toward points of effective performance. My internship group did so largely, as interns still do, by following the maxim “See one, do one, teach one.” In the emergency room or in the intensive care unit or on the wards, you saw “one,” which might be a massive heart attack, or a pulmonary embolism, or a brain hemorrhage, or a grand mal seizure. If you were lucky and it was during the day, the senior resident would not be at home sleeping but would be called to the scene and would rapidly assess the situation, issue orders, and work to save the patient. As the intern “seeing one,” you pitched in, starting, in part, to “do one” by following the resident’s instructions as you listened to the heart and lungs or examined the widened pupils or inserted an airway into a clenching mouth. You listened closely to what the senior resident ordered, the measures he initiated to supply oxygen to an injured lung or stabilize blood pressure with a failing heart or stanch a hemorrhage or arrest the electrical discharges of a seizing brain. If you were very lucky, despite the rush of the moment, the senior resident might offer a few explicit words, explaining the tricks he used to pass a breathing tube into the trachea and not mistakenly into the esophagus, how to adjust the dose of an anticoagulant for a pulmonary embolism, which drug he preferred to try to restore falling blood pressure or stop a seizure. The next time, you were

more ready to imitate him. You were beginning to think and act simultaneously.

It took Dr. Burnside some fifteen seconds to figure out what was wrong and what to do for William Morgan. Physicians had fifteen years to ponder Anne Dodge's case. Anne Dodge was dying a slow death from malnutrition; William Morgan would have died quickly from acute heart failure. Anne Dodge's condition called for the withdrawal of a single dietary component, gluten; William Morgan's demanded complex intervention, opening his heart and inserting a new valve. Given these contrasts, you might imagine that a doctor thinks differently with an Anne Dodge than with a William Morgan. Certainly, time and task determine how much deliberate analysis is called for versus how much rapid intuitive thinking is required. But I would argue that important similarities outweigh any differences. In both cases Myron Falchuk and John Burnside recognized a clinical pattern. And in both cases they had to modulate their inner emotions. Falchuk had to avoid the negative feelings that physicians have for patients labeled as "psychiatric," seeing such people as neurotic, cloying, deranged, and generally delusional, a burden because they do not tell the truth, their physical complaints not worth taking seriously because their symptoms originate not in the chest or bowels or bones but in the mind. A wealth of research shows that patients thought to have a psychological disorder get short shrift from internists and surgeons and gynecologists. As a result, their physical maladies are often never diagnosed or the diagnosis is delayed. The doctor's negative feelings cloud his thinking. Burnside faced a different challenge: to lower his level of arousal so he could think and act quickly and effectively. In each case, correctly adjusting the emotional temperature saved a life. Cognition and emotion are inseparable. The two mix in every encounter with every patient, obvi-

ously in a clinical catastrophe like William Morgan's, more subtly in a drawn-out chronic case like Anne Dodge's.

The importance of a physician's insight into his inner state came into sharp focus when I told colleagues what had happened in William Morgan's room. My fear and anxiety were familiar to them. But what I and my colleagues rarely recognized, and what physicians still rarely discussed as medical students, interns, residents, and indeed throughout their professional lives, is how other emotions influence a doctor's perceptions and judgments, his actions and reactions. I long believed that the errors we made in medicine were largely technical ones — prescribing the wrong dose of a drug, transfusing a unit of blood matched for another person, mislabeling an x-ray of an arm as "right" instead of "left." But as a growing body of research shows, technical errors account for only a small fraction of our incorrect diagnoses and treatments. Most errors are mistakes in thinking. And part of what causes these cognitive errors is our inner feelings, feelings we do not readily admit to and often don't even recognize.