Thirty Operating Rules for Infectious Diseases Apprentices

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Abstract: Like most physicians, we have developed our clinical skills by caring for patients, reading, discussing with other clinicians, and watching our mentors at work. Also, like most experienced clinicians, we rely on a relatively small number of basic rules repeatedly to guide our decisions in everyday practice. In fact, our daily clinical practice relies as much on this passed-down wisdom as on scientific data. These and other hard-won insights about the often-mysterious process of clinical decision making have traditionally been transmitted from physician to physician by example and via hallway conversation rather than via the written word. These rules are not meant to be definitive but have been put forward to encourage dialogue between clinicians about the process of clinical care and provide trainees with some useful guideposts in learning their way in the world of clinical practice.


Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?
—T S Eliot

Much of the practice of clinical medicine is empiric, and many clinical decisions are based on physician judgment rather than the literature. Moreover, ready access to medical information does not always lead to good clinical judgment. Most physicians have developed their clinical skills by caring for patients, reading, discussions with other clinicians, and watching their mentors at work. Paradoxically, good clinical skills often come from observing the impact of poor skills; as Dr Eugene Stead Jr, the late and former chairman of the Duke Department of Medicine, said, “There is much to be learned from watching bad doctors practice bad medicine.”

The rules that follow originally came from our teachers or were deduced through the process of caring for patients.

These rules have subsequently been formulated and refined after discussions among ourselves. We admit most of these rules are not original; however, with the fog of time and our collective memory lapses, some of their sources are now obscure. We also acknowledge that none of the ideas are based on controlled clinical trials; most, if not all, have exceptions, and none are perfect guidelines for clinical management. Other infectious disease specialists may have similar, better, or more useful rules. If so, we look forward to seeing them in print.

• Rule 1. Get as much experience as you can.

Clinical experience can only be acquired over time and only with close clinical contact, rather than from books or secondhand tales. Experience is of no value unless we learn from it; failure to do so makes us like “Napoleon’s mules” (who had seen a hundred campaigns, but were still mules). Experience must be supplemented, nourished, and continually updated by clinical discussion, reflection, and reading.

• Rule 2. Watch how great clinicians work.

Trainees and students should shadow skilled clinicians as much as possible and watch like a hawk. Ask “why” and “how” questions. In the words of Sri Ramakrishna, “Do not seek illumination unless you seek it as a man whose hair is on fire seeks a pond.” This rule is also useful for even seasoned clinicians. The best clinicians continue to watch and learn from their colleagues and peers.

• Rule 3. Try to understand how medical diagnoses are made and reasons why they can go wrong.

Biased judgment is the bane of clinical reasoning. Errors in judgment are more often because of wayward reasoning than lack of medical knowledge. Understanding the diagnostic process and how it can come unstuck makes for better clinical practice.

• Rule 4. Get the facts right.

Many preventable diagnostic mistakes are because of a hastily taken history or inadequate physical examination. If you have no idea of the causes of your patient’s illness after completing your history, start over and be thorough. Ask “where have you been?” and “what have you been doing?” Examples abound of the consequences of breaking this basic rule; patients with treatable illnesses such as malaria can go undiagnosed and even die simply because the right facts were not collected during the history.

The physical examination must be focused although thorough. Often, it is neither possible nor desirable to conduct a complete examination; however, a thorough examination contains elements that should never be omitted. For example, a rectal examination and testing for occult fecal blood should be done in a patient presenting with fever and...
abdominal pain before ordering a mesenteric arteriogram. This is common sense, yet we and our other experienced colleagues know of many situations where such simple things are omitted in the rush to use technology to make diagnoses. The corollary of rule 4 is also important: to avoid making diagnostic mistakes, be sure to do the basic and routine things first.

- Rule 5. The timing of symptoms is important.

Infectious illnesses tend to be shorter than other medical problems, and particular and careful attention should be paid to the chronological development of symptoms. A day-to-day account is necessary for illnesses shorter than 2 weeks. The temporal relationship between symptoms is as important as the symptoms themselves. Knowing the order, severity, and progression of symptoms is the key to building a pattern. Two patients admitted with the triad of headache, fever, and vomiting may have entirely different illnesses depending on the sequence of symptoms. Similarly, a patient with fever followed by jaundice is unlikely to have the same illness as a patient who first notes jaundice and then develops fever.

- Rule 6. Study the old medical chart.

If the old chart is not at hand, hunt it down. It is crucial to know what has happened to the patient in the past and whether his or her immune system is compromised. A recent operation should activate Petersdorf law (“When a patient has fever postoperatively, it is usually related to the surgical procedure”). Recent accidents, injuries, and medications may be the direct cause of the illness (eg, drug fever, and rash from an antibiotic) or predispose the patient to specific infections. Antibiotics and antipyretics may affect the pattern of illness. However, it is also important to remember that old records can contain errors. Thus, a critical review of old records is sometimes necessary to separate evidence from conclusions.

- Rule 7. Listen to family members, nurses, and other health care workers.

Failure to obtain readily available information about your patients from these sources can lead to stupid mistakes and missed opportunities to improve management. A spouse may identify the source of the patient’s illness when the patient is unable to recall. Moreover, vital historical information may not be disclosed at the time of the initial history and physical examinations. This rule is often learned the hard way. For example, a patient with Wegeners granulomatosis was admitted to one of the hospitals where we practice to receive experimental therapy after failing to respond to outpatient prednisone and cyclophosphamide. On the 10th day of hospitalization, the night nurse related that the patient was not surprised that her previous therapy had failed because she had not taken it.

- Rule 8. Take nothing for granted; secondhand information is often wrong.

Although it is impossible to confirm all the data gathered on each patient, experienced clinicians have learned the hard way that reliance on secondhand historical information, biopsy reports, surgical findings, and imaging studies can lead to disaster. Always confirm key findings by going back to the patient or family member or by discussing findings with the pathologist, surgeon, or radiologist. A corollary to rule 8 is to be skeptical and realistic about the validity of information delivered orally in hallway or telephone conversations. For example, a positive blood culture for Enterobacter could, in fact, be enterococcus if a participant in an oral conversation makes a slip of the tongue or the listener has a lapse in concentration. Such errors sound improbable, but they frequently occur in daily practice.

- Rule 9. More than one infection may be present, particularly in the elderly, the immunocompromised, and the returned traveler.

Occam razor is an instrument with which many clinicians eventually slit their throats. But it is also useful to remember Hickam dictum: patients can have as many diseases as they damn well please. 

- Rule 10. Go for the usual suspects.

Unusual presentations of common infections are more likely than rare infections and even more likely than uncommon presentations of uncommon infections. This rule is widely known, but commonly forgotten, especially in tertiary care medical centers, where everyone knows or has heard of a single exception. Many physicians, even bright ones, cannot resist the urge to “go for an inside straight.” Like many poker players, such physicians rarely talk about or acknowledge their losses. However, unlike irrational gamblers who repeatedly draw for an inside straight, doctors who immediately seek esoteric diagnoses are not responsible for the money lost on unnecessary tests.

- Rule 11. Consider diseases that must not be missed.

Skilled clinicians should not only remember to concentrate on probability but also consider first diseases that must not be missed because of their potential seriousness. Most important are diseases for which there is an effective treatment. For example, meningococcemia and Rocky Mountain spotted fever should be remembered as possibilities in every acutely febrile patient from North Carolina who presents with thrombocytopenia and/or a rash.

- Rule 12. Pain is a friend of the diagnostician.

Severe muscle pain, even in the absence of overt fever, is often an early symptom of bacteremia; it is also a feature of myositis and necrotizing fasciitis. Severe muscle pain points to potential sepsis and is not just as a nonspecific prodromal symptom of infection. Localized pain is valuable in establishing the site of infection. For example, vertebral osteomyelitis and epidural abscess should be considered in a patient with fever and back pain. Although pain can rarely be a false localizing symptom, it is a good idea to carefully listen to patients complaining of pain and consider the possible infectious causes for this pain.

- Rule 13. Use Sutton law, but be sure you are right about where the money is.

Sutton law recommends performing the procedure most likely to yield a diagnosis. The name of the law came from a response attributed to William Sutton, a bank robber

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in the early 20th century, who, when asked for his reasons for only robbing banks, replied, “Why? That’s where the money is.” The phrase “go where the money is” was first formulated by Dr William Dock and then popularized by Petersdorf and Beeson in their article on fever of unknown origin. This advice is still timely, but the array of diagnostic tests available to modern clinicians makes it even more important to have a clear idea of what you are looking for before a test is ordered.

• Rule 14. Sometimes you have to “undiagnose” a patient before arriving at the correct diagnosis.

Many patients travel to new doctors or medical centers burdened with long-standing labels of diseases they may not actually have. Erroneous labels can interfere with making the right diagnosis; this is called anchoring bias. Irritable bowel disease may actually be inflammatory bowel disease and vice versa. A patient with supposed tuberculous pericarditis who fails to respond to therapy may not have tuberculoses.

• Rule 15. The test of time is often the best test.

Many diseases cannot be diagnosed or ruled out in their earliest phases. Diagnoses often become easier with time. Patients tend to accept this diagnostic strategy if they know that there is a plan and they are carefully reviewed each day. The test of time is best used by physicians who are skilled in physical examination and can be available for timely follow-up.

• Rule 16. Trust the history, especially if it is carefully taken.

If a single laboratory or imaging test result contradicts compelling historical or deductive evidence, do not immediately abandon your diagnosis. History often trumps laboratory or imaging test results. In this age of evidence-based medicine, most young doctors know about positive and negative predictive values and can accurately discuss the meaning of specificity and sensitivity, but too few have confidence in a good history. For example, a patient with Staphylococcus aureus bacteremia and severe back pain may initially have a normal magnetic resonance imaging result. Diagnostic abnormalities may show up 4 days later when it is repeated, but only physicians who trust their history will have enough confidence to repeat an initially negative study.

• Rule 17. When in doubt, go back to the patient.

When you are lost in the diagnostic process, stop, look, and think rather than wandering in circles repeating the same or similar tests over and over. If you are adrift and have no idea what is wrong, go back and retake the entire history. More “second-chance” diagnoses come from repeating the history than from repeating a specific test or ordering an uncommon test.

• Rule 18. It is more important to do right than be right.

Physicians must learn to focus on the process of care rather than making clever diagnoses. For example, a logical approach to the empiric management of sepsis is more important than making a conclusive diagnosis in the first few hours of hospital care. Guessing wildly and giving narrow initial therapy is often unwise, even if it turns out to be correct. Treating an elderly immunocompromised patient who presents with signs and symptoms of meningitis with therapy that only covers Listeria spp is the wrong thing to do even if it turns that Listeria meningitis is the right diagnosis. Rules 11 and 18 are sometimes interconnected when it comes to therapy.

• Rule 19. No diagnosis leads to no direction.

Empiricism is a necessary component of medicine, but empiric therapy is not a compass. Failure to make a clear diagnosis leads to unforeseen consequences. When physicians embark on a therapeutic journey without a clear starting point or destination, it can lead to a series of worsening blunders, sometimes called spiraling empiricism, with unexpected complications. For example, empiric therapy for a suspected fungal infection in an immunocompromised patient can lead to drug toxicity that, in turn, leads to more complications, such as dialysis and device-related infection. To make matters worse, the treating physician is often unable to distinguish between the untoward effects of treatment and the underlying disease process. A good clinician asks, “what are the consequences if I’m wrong?” Remember the old maxim, “it is easier to stay out of trouble than get out of trouble.”

• Rule 20. If you do not know what is wrong, establish what is not wrong.

This rule becomes easier with repeated application. Minds may go blank when facing a new and unfamiliar problem. This rule helps one to start thinking. For example, a patient with unexplained fever and a normal urinalysis probably does not have a urinary tract infection. Such basic information can guide decisions about empiric therapy and further investigation. Stating at the outset, what you know is not wrong can be particularly useful in the evaluation of fever in patient in intensive care and averts the cascade effect or spiraling empiricism.

• Rule 21. The hardest thing to do in medicine is to appear to be doing nothing.

We call this MICO—masterly inactivity and catlike observation. The ability to wait and watch, without changing therapy or ordering more tests, requires experience and confidence, especially when there are pressures from the family or the nursing staff to take decisive action. Sitting tight requires knowledge about the natural history of infectious diseases and the response to treatment. For example, it is reasonable to sit tight when a patient has persistent chills, fever, and tachycardia 24 hours after drainage of a liver abscess when you have confidence in the current therapy. Similarly, the best management for a patient with low-grade fever and a cherry red leg, 48 hours after initiation of therapy for streptococcal cellulitis, is usually to continue the current therapy. Physicians who do not understand this rule are likely to order unnecessary tests and end up playing “musical antibiotics.”

• Rule 22. If you think a patient has an infection and you look carefully and do not find one, then there may not be one.

Intuitively, this rule seems unwise, but experience tells us otherwise. There comes a point along the diagnostic path when it is better to change direction than pursue ever more esoteric infections. The turning point may not always be obvious, particularly to the physician in a tertiary care center where fear of failure to yield a diagnosis may get in the way of managing the patient’s illness and/or anxiety.
• Rule 23. Accept that some conditions simply have no solutions.

Some patients have irreversible conditions for which there is no effective treatment or satisfactory therapeutic option. Recognizing this fact avoids useless investigations and attempts at therapy. There are numerous examples. Someone with long-standing quadriplegia and refractory extensive pelvic decubitus ulcers with osteomyelitis does not have a curable problem, although it is feasible and important to care for such a patient. This rule may be simple to some, but impossibly vague to others. Those who find it vague are advised to ponder the message Cervantes transmitted through his magnificent character, Don Quixote.

• Rule 24. Diagnosis is an ongoing process; beware of locking it in.

There are no irrefutable hypotheses, only unrefuted ones, and every diagnosis has a differential diagnosis. We should not arrive at a diagnosis and abandon any further consideration of alternative explanation. We need to remain alert for information that does not fit with our current hypothesis and be ready to look again. Ask, “what if the provisional diagnosis is wrong?” This is one way of avoiding premature closure—the most common cause of misdiagnosis. The ability and need to reexamine new data as it relates to the working diagnosis are critical skills.

• Rule 25. Do not let skin get between you and a diagnosis.

Often the skin is a barrier to making a pathological diagnosis. In our experience, too many patients are sent for sophisticated imaging studies and have an impressive array of tests when sampling a skin, subcutaneous, and deeper lesion with a scalpel or biopsy needle would quickly yield the diagnosis.

• Rule 26. Make sure all biopsy specimens are sent for culture if infection is included in the prebiopsy differential diagnosis.

Too often, there is retrospective diagnostic remorse when this is forgotten. Yet another test will be required. Virtually every infectious disease specialist we know has encountered patients who have lymph node biopsies showing granulomas that were discovered after the entire specimen was placed into a formalin preservative, making it impossible to obtain a microbiological diagnosis.

• Rule 27. Always correlate gram stain results with culture results.

Organisms recovered from culture may not be the cause of the disease and vice versa. They may just be bystanders or there may be more than one pathogen involved. For example, anaerobes are also likely to be present even if culture report of a specimen from a liver abscess shows a pure growth of an aerobic gram-negative enteric rod. Antimicrobial therapy can cause similar discordance between results of Gram stains and cultures.

• Rule 28. The initial response to treatment may not be due to the antibiotic(s) prescribed.

The initial response to treatment may be misleading. Improvements in symptoms and well-being may be because of correction of fluid loss or electrolyte imbalance, circulatory support, steroid therapy, or simply the natural course of the disease. Other patients may recover in spite of antimicrobial therapy rather than because of it. Remembering this may help understand that some recurrences of diseases are not relapses of a partially treated infection. All experienced clinicians have learned this rule the hard way.

• Rule 29. Medical treatment of surgical problems will usually fail.

This rule could be expanded into a book with many chapters. Unsuccessful medical therapy of an infected prosthetic device, failure to drain a collection of pus, and failure to debride necrotic tissue are examples of what occur regularly in daily practice. Physicians who violate this rule often seek temporary solutions such as switching to the newest broad-spectrum antibiotic that actually may delay or prolong the problem they hope to fix.

• Rule 30. Blood flow is required for the cure of infections.

Poor delivery of white cells and antibiotics to an infected area makes failure inevitable. This rule especially applies to dead bone, cool legs, and necrotic tissue. Alas, it is often ignored in the belief that control (of an infection) is almost as good as cure. Although there are circumstances when control is the best option, they are few, and the outcomes are predictably poor.

CONCLUSIONS

We suspect that most experienced clinicians rely on a relatively small number of basic rules that are used repeatedly to guide their decisions in everyday practice. Our daily practice relies as much on this passed-down wisdom as on scientific data. Hard-won insights about the often-mysterious process of clinical decision making have traditionally been transmitted from physician to physician by example rather than via the written word. These rules are not meant to be definitive but have been put forward to encourage dialogue between clinicians.

Patients want certainty; doctors strive to offer certainty. Science offers an illusion of certainty that belies its ability. Clinical judgment is perhaps a more realistic assessment of how doctors think and what we can offer to our patients.

—Dr. Danielle Ofri

REFERENCES


