From the President

Critical Thinking in Crisis

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Medicine is an applied epistemology. Before it is a science of molecules or a craft of hands, it is a discipline of thinking—concluding indecisively, since our conclusions remain subject to further observation; under time pressure; and with incomplete information about what examination, history, and conversation reveal in each patient. Everything else follows from that. A physician who reasons badly will prescribe badly, however current his knowledge.

The erosion of critical thinking is not an abstract complaint but an occupational threat—one which our profession has seen with unusual clarity since 2020. The phrase has been eroded by overuse. In most institutional settings it now means "healthy skepticism," which is not a method but a mood.

The classical meaning is more demanding. Critical thinking is the disciplined, impartial analysis of evidence and observation, and the questioning of assumptions, in service of sound judgment and action. It requires distinguishing the different ways a proposition can be believed—direct observation, valid inference, analogy, authoritative testimony, holding each to its own standard, weighing evidence against one's position, and remaining in doubt when doubt is the honest state.

That last requirement is the one that fails first.

The Western tradition begins with Socrates, whose method demonstrated that confident knowledge often dissolves under questioning, and whose central claim was that wisdom consists in recognizing what one does not know.[1] Aristotle systematized this into logic proper, distinguishing valid from invalid inference and cataloguing the ways arguments fail.[2] Francis Bacon extended the project. His "idols of the mind" were an early taxonomy of cognitive bias—systematic errors that distort perception before reasoning even begins.[3] Descartes turned the method inward through systematic doubt.[4]

In the twentieth century, Dewey reframed it as *reflective thinking*: the active, persistent, careful examination of a belief in light of the grounds that support it and the consequences to which it leads.[5] The modern synthesis added something important. Popper argued that what distinguishes science from pseudoscience is not confirmation but *falsifiability*—a theory that forbids nothing explains nothing.[6]

Kuhn showed that scientific communities do not abandon a paradigm when anomalies appear; they absorb the anomalies until the accumulated strain forces a break.[7] Kahneman and the cognitive-bias literature then documented in the laboratory what Bacon had inferred from observation: that reasoning errors are not occasional lapses but structural features of how the mind works.[8]

This tradition gives us a warning and a tool. The warning is that intelligence offers no protection. Highly trained people fail in patterned, predictable ways. The tool is a set of external checks, adopted precisely because internal confidence is unreliable.

The Indian tradition arrived at a complementary architecture, and in one respect a sharper one. Where the Western lineage largely asks *whether an argument is valid*, the ***Nyāya*** school asks first *by what instrument it was known*.

Nyāya epistemology is built on the concept of ***pramāṇa***—the valid means of knowledge. Classical *Nyāya* recognizes four valid means: ***pratyakṣa*** (direct perception), ***anumāna*** (inference), ***upamāna*** (comparison or analogy), and ***śabda*** (reliable verbal testimony). Every knowledge claim must be traceable to one of these, and each carries its own conditions of validity.[9] A claim that cannot name its *pramāṇa* is not knowledge; it is opinion wearing knowledge's clothes.[10]

Two features of this system are directly useful to physicians.

The first is ***vyāpti***—invariable concomitance. Inference is valid only where a genuine, exceptionless relation holds between the observed sign and the inferred conclusion. Where there is smoke there is fire because the relation is invariable. The classical texts are meticulous about both the conditions for establishing *vyāpti* and about ***tarka***—the hypothetical reasoning that tests a proposed relation by following its denial to absurdity, and which classical *Nyāya* treats as an aid to the means of knowledge rather than one of them. This is an ancient formalization of the same principle later developed into formal criteria for causal inference: association is not causation, and the burden of establishing the connecting relation is on the one asserting it.[11]

The second is the treatment of ***śabda***. Testimony *is* a valid means of knowledge in this system. The tradition does not pretend that we can verify everything ourselves. But its validity is conditional. Testimony yields knowledge only when the speaker is ***āpta***: one who knows the matter directly, has no motive to deceive, and can communicate it accurately. Strip away any of those three conditions and the testimony conveys no knowledge at all, however eminent the speaker.[12] This is a far more useful account of expertise than the flattened modern alternatives. It refuses both the naive position that credentialed authority settles questions and the corrosive position that authority is worthless. It tells us instead exactly what to check.

Medicine has never enjoyed clean experimental feedback. Our signals are noisy, our confounders numerous, our subjects unwilling to be randomized into the arms we would find most informative.

Where a discipline can put a theory at genuine risk of refutation, error is self-correcting; where it cannot, error accumulates. The result is a discipline uniquely vulnerable to the substitution of consensus for evidence.

Semmelweis is the canonical case: having noticed that puerperal mortality was far higher on wards where physicians arrived straight from autopsies, he instituted handwashing, and mortality plummeted—yet, holding no standing in the relevant

hierarchy, he was ridiculed for two decades by colleagues whose real objection was the implication that they themselves were the vectors of death.[13] This was before anyone knew that invisible organisms could infect humans and cause death.

Austin Bradford Hill's 1965 address on association and causation remains the most cited and least read document in clinical epidemiology. Hill offered nine considerations: strength, consistency, specificity, temporality, biological gradient, plausibility, coherence, experiment, and analogy. He stated plainly that these were aids to judgment, not a checklist to be scored. They have since been treated almost universally as the checklist he warned against.[14]

Sackett's 1996 definition of evidence-based medicine likewise took pains to say what EBM was not: it was not cookbook medicine, and it explicitly required the integration of individual clinical expertise with external evidence.[15] That qualifier has been steadily eroded, and with it the physician's standing to reason about the individual patient.

Then Ioannidis, in 2005, gave the field its most uncomfortable result: that under realistic assumptions about study power, effect sizes, bias, and the number of teams working a question, most published research findings are false.[16] This paper has been cited tens of thousands of times and has changed clinical practice very little.

This brings us to the post-COVID present. Readers of this journal—and I include myself—may be inclined to treat that record as a settled indictment. That inclination is itself a failure of the discipline I am defending. Consider four documented failures.

Failures of Critical Thinking Related to COVID-19

Premature Closure of Investigation

In February 2020, a letter in *The Lancet*, signed by 27 scientists, condemned as "conspiracy theories" the suggestion that SARS-CoV-2 might not have a natural origin.[17] There were no scientific references refuting a laboratory origin. It was published weeks into the outbreak, before the evidence that would bear on the question existed. The journal later issued an addendum on the authors' competing-interest declarations, its editor acknowledging that the relevant disclosure should have appeared in the original letter.[18] Whatever the answer on origins proves to be, the epistemic error is independent of it: a question was closed before it was investigated, enforced by the vocabulary of pathology, not evidence.

Authority against Mechanism

In July 2020, 239 scientists published an appeal in *Clinical Infectious Diseases* asking physicians and international bodies to recognize the potential for airborne spread.[19] The physics of respiratory aerosols was not new or seriously contested. Guidance nonetheless lagged by months, anchored to a droplet-versus-airborne dichotomy that aerosol scientists had regarded as obsolete for decades. Institutional inertia, not evidence, set the timeline.

Failure of the Verification Apparatus

In May 2020, both *The Lancet* and the *New England Journal of Medicine* published analyses drawing on a hospital database from an unknown company. Within three weeks both papers were retracted, after the authors could not obtain the underlying data for independent audit.[20,21] Policy—including the suspension of trial arms—had already acted on the papers. The most rigorous peer review in medicine did not detect the problem; outside statisticians reading the published tables did.

Inverted Uncertainty

The 2023 Cochrane update on physical interventions was reported by many as proof that masks do not work. Cochrane's editor-in-chief issued a statement calling that reading inaccurate, the review's results inconclusive, and the review unable to address whether mask-wearing itself reduces risk.[22,23] This is the most instructive failure of the four, because the error runs in both directions. Earlier public assertions of certainty had outrun the evidence; the counterreaction then converted "we do not know" into "we know it does not work." Absence of evidence had become evidence of absence—an elementary error, committed with great confidence by people who believed themselves to be the skeptics.

The COVID Evidence Fiasco

Ioannidis's March 2020 warning that we were making enormous decisions on unreliable data—a "once-in-a-century evidence fiasco"—was correct, and the professional abuse he received for it was disgraceful.[24] Some estimates advanced in the heterodox camp were also wrong, and a few of the sources our colleagues rely on practice exactly the selective citation they condemn in others. A critical thinker does not get to apply the standard asymmetrically. If we demand falsifiability, pre-registration, and disclosed interests from the institutions, we owe the same to ourselves, and we owe it most when the conclusion flatters us.

In *Nyāya* terms, what actually collapsed was the *āpta* condition. The public was told to accept testimony as knowledge while those conditions were visibly failing. When testimony is demanded without them, the demand is not epistemic. It is political. And the predictable consequence is not obedience but the wholesale collapse of trust in testimony as such—where much of the public now sits, in a condition worse for medicine than any single error we made.

Consider a worked example. During the 2020–2021 season, influenza effectively vanished. Of 818,939 respiratory specimens tested by U.S. clinical laboratories between late September 2020 and late May 2021, 0.2 percent were positive for influenza. In each of the three preceding seasons, positivity had peaked between 26 and 30 percent.[25] This was the lowest influenza activity since at least 1997, the first season for which public data exist.[26] Clinicians who spent that winter seeing a ward full of one diagnosis and none of the other were not imagining it.

There were two hypotheses: that influenza cases were captured as COVID-19 (by test misassignment, coding, or diagnostic attention), or that influenza transmission collapsed. Both explain the observation. Neither is established.

This is precisely where classical method demands something specific: not more evidence for the preferred hypothesis, but the observation the two hypotheses forbid differently. *Tarka*—following a proposed relation to its consequences and asking what

its denial would require—is the operation, and *vyāpti* the standard. What must be true if the first hypothesis holds?

It must be true that we stopped looking. We did not. Canadian laboratories ran roughly twice their six-season average weekly test volume that autumn while positivity stayed near zero;[27] the American figure rests on approximately a million specimens.[26]

It must be true that the assays could not distinguish between the two agents. They could. By late 2020 most institutions ran multiplex panels: one swab, one cartridge, separate targets for influenza and SARS-CoV-2. A misassigned influenza case would still illuminate the influenza channel.

It must be true that the suppression was non-selective. It was not. The B/Yamagata lineage of influenza B, which had circulated globally since the 1970s, has not been identified anywhere since 2020,[28] while influenza A and B/Victoria resumed ordinary seasonal patterns by 2022.[29] The World Health Organization recommended removing the B/Yamagata component from vaccine composition, and it was dropped from U.S. formulations beginning in 2024–2025.[30,31] Misassignment cannot produce this. Relabeling influenza as COVID would suppress both B lineages in proportion; it cannot delete one clade by sequence while its sister recovers.

It must be true that influenza could not return while the alleged mechanism persisted. It did return, in 2022, with COVID surveillance still operating on an enormous scale.

The hypothesis that influenza cases were captured as COVID-19 is thus not merely unsupported. It is excluded by observations that were already in hand.

What the second hypothesis warrants is more limited than it might seem: that influenza transmission collapsed does not establish which intervention collapsed it. Border closure, the near-total cessation of air travel, and school closure were imposed simultaneously with masking, and influenza is far more dependent on travel seeding than SARS-CoV-2 proved to be by mid-2020. Some virologists invoke viral interference. The episode shows that something in that bundle severed influenza's transmission chains. It does not specifically support masks. Treating it as vindication of any single measure would repeat, in the opposite direction, the error described above.

One real criticism remains worth pressing: attribution. Death certification conflated dying *of* the disease with dying *with* it. Universal admission screening fed incidental positives into hospitalization counts, and case definitions shifted mid-course. These are documented, quantifiable, and require no exotic premise—only recognizing that the counting was imprecise. That criticism survives scrutiny. The stronger claim—that influenza cases were systematically reclassified as COVID-19—does not, and advancing it is what allows the weaker and better one to be dismissed along with it.

Where Is This Type of Analysis Taught?

Where was any of this supposed to have been taught? The answer is uncomfortable. On paper, critical thinking is a universal requirement of American undergraduate education. Nearly every institution names it among its general-education learning outcomes,[32] and several states mandate it directly. Critical thinking is first among the six core objectives Texas requires public institutions to embed in the curriculum.[33] But the delivery model is infusion rather than instruction. No single course teaches the objective; it is distributed across composition, history, and a laboratory science, with faculty merely attesting that it has been embedded. A student can satisfy the requirement without ever encountering a fallacy taxonomy or a formal treatment of inference. Logic, epistemology, and philosophy of science remain departmental electives that most undergraduates never take.

For those of us who went on to medicine, the gap is wider still. No standard premedical prerequisite includes logic or philosophy of science. We require organic chemistry of every applicant and formal reasoning of none. Medical school then adds pathophysiology and a statistics course usually taught as computation—how to run the test, rarely how to decide what its result entitles us to believe.

Whether the infused model works at all is genuinely contested. The most-cited study reported that a large share of undergraduates showed no significant gain in critical thinking over two years.[34] Its statistical method has since been challenged as misapplied, leaving the headline figure unable to bear the weight placed on it.[35] The honest summary is that we do not know, which is itself the point: we mandate an outcome we do not teach and cannot reliably measure.

I do not think we recover this by exhorting each other to think critically. Dispositions do not respond to exhortation. Practices do. Four are within reach of any physician:

- **Name the *pramāṇa*.** For any clinical claim you rely on, state how it is known. Direct observation? Inference from mechanism? Analogy from a related condition? Testimony from a guideline? Each is legitimate; each fails differently. Most clinical disagreement dissolves once both parties notice they are working from different instruments.
- **Apply the *āpta* test to testimony, including your own.** Does this source have direct knowledge of the matter? What are its interests? Is it transmitting accurately?
- **State your falsifier in advance.** Before you commit to a position, write down what observation would change your mind. If nothing would, you hold a commitment, not a conclusion. This applies with particular force to positions we hold against the consensus, which are the ones we protect most vigorously.
- **Preserve the standing of doubt.** The classical traditions treat doubt—***saṃśaya***—as the legitimate starting condition of inquiry, not as a failure of nerve. A profession that punishes "I don't know" will get confident answers, and they will not be true.

Conclusion

The office I hold obliges me to say something about what this organization is for. I would put it this way: our value is not that we hold particular contrarian conclusions. Conclusions are perishable. Our value is that we insist on the conditions under which a conclusion can be trusted at all—disclosed interests, available data, falsifiable claims, the physician's standing to reason about the individual patient, and the right to say publicly that a question is still open.

That commitment is worth more than any position we currently hold, and it is the only thing that will still be worth defending when the next crisis arrives and we find, as we will, that some of what we were sure of was wrong.

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