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Beyond the Limits of Applying the Concept of 'Pseudoscience' in Medicine

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ABSTRACT

The concept of pseudoscience is often understood through strict epistemic criteria like falsifiability and empirical verification, which do not accurately reflect how medical knowledge functions in real-world contexts. Clinical reasoning in medicine occurs amid uncertainty and requires moral judgment, contextual awareness, and responsiveness to individual patient narratives—elements that cannot be solely validated through experimental methods. While medicine relies on scientific evidence, it also integrates interpretive and experiential insights that extend beyond pure biomedical science. A rigid application of the pseudoscience label can obscure the practical and relational aspects that are essential to both healing practices and scientific inquiry in medicine. The paper begins by assessing the current use of the concept of pseudoscience in medical discourse, suggesting that it is based on outdated views and fails to capture recent advances in demarcation theory. It argues that this narrow interpretation is inadequate and delivers practical consequences that undermine medical objectives. Subsequently, by utilizing Mahner's tripartite model—pseudoscience, pseudotechnology, and pseudohumanities—the author proposes a more effective framework for evaluating medical claims and practices. Ultimately, the philosophy of medicine requires a dual-critique approach that enables examination of both mainstream (MS) medicine and alternative, non-mainstream (NMS) healing practices, fostering a more nuanced understanding of the complexities of the medical field.

Keywords: Pseudoscience, medicine, demarcation, validation.

Introduction

Since the emergence of Greek rational medicine, the medical profession has consistently worked to demonstrate the effectiveness of its interventions while protecting the field from fraudulent practices. In recent decades, this effort has been reflected in the growing use of pseudoscience as a central theme in medical debates. It is used to separate what is perceived as legitimate from what is dismissed as illegitimate, the scientific from the unscientific. At first glance, such distinctions may seem necessary, perhaps even protective. Yet upon closer examination, they reveal a deeper problem: Medicine is not simply a science to be neatly demarcated; it is a practice informed by science, shaped by technology, and grounded in human values. The standards that define valid medical knowledge are not identical to those that represent good scientific theory (Sadegh-Zadeh, 2015).

The question motivating this paper arises from that tension. It asks why the contemporary use of pseudoscience in medicine appears insufficient—not because medicine lacks scientific grounding, but because the language of demarcation fails to capture the whole reality of medical practice. My aim is not to defend unscientific approaches, but to show how medicine itself requires a more nuanced form of reflection—one that acknowledges its scientific roots without losing sight of its technological, moral, and human dimensions (Monajemi, 2025; Schramme, 2015).

In this paper, I begin with a brief overview of the concept of pseudoscience and then turn to its contemporary applications in medicine. I argue that the interpretation of pseudoscience currently employed in medical discourse is rooted in an outdated conception, fails to reflect recent developments in the demarcation literature, and ignores the nature of medicine. After outlining these historical and conceptual preliminaries, I show why the deployment of the pseudoscience label in medicine is conceptually insufficient and carries practical implications that ultimately undermine the aims of medicine itself.

In the second part of the paper, drawing on Mahner's tripartite model of demarcation—pseudoscience, pseudotechnology, and pseudohumanities—and extending it further, I argue that this framework provides a more adequate basis for assessing claims and practices within medicine. Finally, I contend that the

philosophy of medicine, if it is to serve its reflective and critical vocation, requires a mode of *double critique*: one that allows the examination of mainstream medicine and the careful evaluation of diverse non-mainstream healing practices.

2. The origin of Pseudoscience

The term pseudoscience carries the weight of a long philosophical ambition: the desire to draw a clear line between what counts as science and what does not. This ambition traces back to the *classical demarcation problem* in the philosophy of science. Karl Popper famously proposed falsifiability as the defining feature of scientific inquiry. For Popper (2005, 2014), a scientific claim must be open to refutation, whereas pseudoscientific claims protect themselves through ad hoc modifications or unfalsifiable structures. His aim was not merely classificatory; it was a moral defense of the critical spirit of science.

Over time, however, the term's meaning and function began to shift. What Popper had intended as a philosophical safeguard against dogmatism gradually evolved into a label used in practical contexts, including medicine. Instead of being applied to entire theoretical systems—as Popper applied it to psychoanalysis or Marxism—the term became increasingly associated with specific practices or interventions. In contemporary medicine, this shift has been evident (Fuller, 2024; Resnik, 2000). Thus, the history of pseudoscience reveals a vital transformation: from a philosophical criterion intended to protect the integrity of science to a rhetorical instrument used to discipline or dismiss competing clinical approaches. Understanding this shift is essential to assessing why the contemporary use of the term in medicine appears insufficient.

3. The Contemporary Use of "Pseudoscience" in Medicine

In contemporary medicine, the term pseudoscience circulates with remarkable frequency. It appears in editorials, public debates, regulatory discussions, and in the everyday vocabulary of clinicians seeking to protect their profession. Its primary function seems clear: to draw a protective boundary around what is considered legitimate medical knowledge and to reassure patients that biomedical interventions rest on reliable evidence rather than illusion or wishful thinking (Fuller, 2024; Schramme, 2015). The accusation of pseudoscience today often functions as boundary work: an attempt to

reinforce the epistemic authority of biomedicine in an era marked by therapeutic pluralism and public mistrust. Such boundary work can be understandable and at times necessary. Yet when the concept is used without philosophical care, it risks turning into a stigma rather than an analytical tool (Fuller, 2024; Mahner, 2007).

Yet beneath this protective gesture lies a more sophisticated story. The term is increasingly invoked not as an instrument of reflection but as a tool of exclusion. It often supports a vision of medicine that identifies scientific legitimacy solely with randomized controlled trials and methodological orthodoxy. Practices that do not conform neatly to this model — including many forms of complementary and alternative medicine — are swiftly marked as suspect or dismissed outright (Thagard, 2012).

This pattern reveals a more profound conceptual confusion. To call a clinical practice “pseudoscientific” presupposes that medicine is a science in the strict sense, that its value can be measured solely by epistemic criteria such as testability, reproducibility, and empirical adequacy (Popper, 2005). But medicine is not reducible to science alone. It is a practice informed by science, grounded in clinical judgment, shaped by ethical obligation, and sustained through the lived relationship between healer and patient (Gadamer, 2018). To evaluate a therapeutic approach purely by the standards of experimental science is to mistake the method for the whole of medicine.

Thus, the contemporary use of pseudoscience in medicine reflects as much about the anxieties of biomedicine as it does about the flaws of its opponents. It expresses a longing for certainty in a domain where certainty is rare and where decisions must be made under the pressures of time, suffering, and human vulnerability. The challenge, then, is not to abandon the term but to use it with greater philosophical care—to ask what kind of knowledge medicine requires and what forms of validation its practices demand (Fuller, 2024; Monajemi, 2025; Resnik, 2000).

4- The Use of an “Old-Fashioned” Concept of Pseudoscience

A major philosophical critique of the way pseudoscience is invoked in contemporary medicine is that it relies on an outdated, Popperian conception of demarcation. Many defenders of biomedical orthodoxy continue to treat “pseudoscience” as if it referred to a

stable, ahistorical category defined once and for all by falsifiability or methodological rigor. Yet, as post-Popperian philosophy has shown—from Kuhn’s paradigms to Lakatos’s research programmes and Feyerabend’s epistemological pluralism—the meaning and function of the term have profoundly evolved. To employ pseudoscience in its mid-twentieth-century sense in twenty-first-century medicine is therefore to ignore the historical transformation of the concept.

When contemporary critics use “pseudoscience” to disqualify alternative or contested practices in health care, they implicitly assume that the boundary between science and non-science is fixed and self-evident. This is what might be called an “old-fashioned demarcationism”: a reliance on a rigid, positivist logic of falsification that no longer reflects how science—or medicine—actually operates. Such an approach overlooks the social embeddedness, ethical dimensions, and open-endedness of evidence, theory, and practice. Consequently, the uncritical use of the term pseudoscience in medicine reveals not philosophical sophistication but a failure to acknowledge the evolution of epistemological reflection on science since Popper’s time.

5-Contemporary Philosophical Revisions of the Demarcation Problem

The effort to separate science from non-science has a long and restless history. In recent years, several philosophers have returned to this question, not to defend old boundaries but to ask whether the very act of boundary-drawing still serves us. Among them, David Resnik, Paul Thagard, and Jonathan Fuller have each offered ways of thinking that move the discussion from division toward understanding.

Resnik invites us to see demarcation as a pragmatic task rather than a metaphysical one. He reminds us that we draw boundaries for reasons — to guide policy, to protect education, to allocate trust. These boundaries are not eternal; they change with context and purpose. In this view, the question “Is it science?” becomes less about ontology and more about utility. What matters is whether a practice fulfills the goals we assign to science: reliability, accountability, and openness to revision. (Resnik, 2000).

Thagard, drawing on the cognitive sciences, discusses explanatory coherence and conceptual evolution. For him, what distinguishes science from its imitations is not

only evidence but the willingness to change — to integrate new data, to refine its concepts, to admit error. Pseudoscience, then, is not simply false belief; it is the refusal to grow. In this sense, both mainstream and non-mainstream medicine can fall into pseudoscientific patterns when they adhere too tightly to their certainties (Thagard, 2012).

Fuller, writing from the heart of the philosophy of medicine, asks us to bring the question closer to home. The problem of demarcation, he suggests, is not universal but local — it belongs to the history and practice of medicine itself. In the nineteenth century, physicians of the Paris school sought to distinguish

scientific medicine from homeopathy through the principle of “like comparison”: the testing of treatments under similar conditions. This, Fuller notes, became the seed of modern medical empiricism. Yet, he warns that any attempt to fix this principle once and for all risks forgetting that medicine is a living practice, evolving with its methods and its meanings (Fuller, 2024).

Together, these perspectives invite a shift. The question is no longer how to draw a perfect boundary, but how to judge validity within context. In medicine, this means asking not only whether a claim is scientific, but how it serves the broader aims of healing, understanding, and care (Table 1).

Table 1

New approaches to the Demarcation problem in medicine

Author	Core View on Demarcation	Implications for Medicine	Key Concepts
Steve Fuller	Demarcation is socially constructed; scientific legitimacy reflects institutional power rather than intrinsic epistemic superiority.	Mainstream medicine's authority is historically contingent; alternative medical systems cannot be dismissed solely by epistemic criteria.	Social epistemology; legitimacy; institutional power; knowledge politics.
Paul Thagard	Demarcation depends on empirical evidence, theoretical coherence, and plausible mechanisms; pseudoscience lacks these.	CAM modalities without mechanisms or empirical support qualify as pseudoscience; strong emphasis on evidence and mechanism-based reasoning	Empirical support; mechanisms; coherence; consilience.
David Resnik	Demarcation requires balancing epistemic, ethical, and policy considerations; scientific integrity is both epistemic and moral.	Medical legitimacy requires not only scientific validity but ethical responsibility and public policy accountability.	Scientific integrity; ethics; public policy; responsible science

6- Two Distinct Limitations of the Concept of Pseudoscience in Medicine

The limitations of the pseudoscience discourse in medicine become apparent only when we situate it against the multidimensional nature of medical practice. Although the notion of pseudoscience emerged within the philosophy of science as a tool for distinguishing sound theories from defective ones, its conceptual apparatus was never designed to assess a practice as complex, heterogeneous, and normatively charged as medicine. When imported into the medical domain, the concept carries with it a series of assumptions—and a rhetorical force—that narrow the evaluative landscape and obscure dimensions of judgment essential to clinical work. As a result, the employment of the pseudoscience label in medicine suffers from two distinct shortcomings. On the one hand, it is conceptually insufficient, reducing the rich architecture of medical reasoning to a set of epistemic criteria modeled on the natural sciences. On

the other hand, it produces practical and socio-ethical implications that distort dialogue, reinforce polarization, and divert attention from internal failures within mainstream practice. The following sections examine these two limitations in turn, tracing how the demarcation framework, when uncritically adopted, constrains our understanding of medicine and ultimately undermines the very goals of care, trust, and reflexive critique that the label seeks to protect.

6-1. Conceptual Insufficiency: A Mismatch Between Demarcation and Medical Practice

The first limitation of the concept of pseudoscience is conceptual. Pseudoscience originates from the demarcation problem in philosophy of science. It is designed to evaluate scientific theories by epistemic criteria such as testability, empirical confirmation, falsifiability, methodological rigor, and theoretical plausibility. These criteria are appropriate for the

natural sciences, where the primary aim is to produce reliable knowledge about the world.

a. Assumptions of pseudoscience

The concept of pseudoscience rests on several assumptions that are incompatible with the nature of medicine. First, it presupposes the priority of the natural sciences, an assumption rooted in classical demarcation thinking (Popper, 2005). Second, it assumes a linear, simplified model of the relationship between science and technology, in which technology is merely an application of scientific knowledge—an assumption increasingly criticized in contemporary philosophy of technoscience (Fuller, 2024). Third, it relies on a fallacy of inspiration from the natural sciences—the idea that anything wishing to count as scientific must follow the methodological and epistemic model of the natural sciences, a view problematized in philosophy of medicine and the medical humanities (Gadamer, 2018; Schramme, 2015).

Finally, it implicitly assumes that whatever is scientific is necessarily ethical, and this is why proponents of evidence-based medicine often seek to treat whatever possesses sufficient evidence as automatically justified morally, despite repeated warnings that evidence alone does not settle the ethical dimensions of clinical care (Ahuja, 2013; Kelly et al., 2015).

b. EBM criticisms by philosophy of science

A substantial body of criticism has been directed at Evidence-Based Medicine (EBM), particularly by philosophers of science who question its epistemological assumptions and practical consequences. One central line of critique concerns EBM's overly hierarchical conception of evidence, which elevates randomized controlled trials and meta-analyses while marginalizing clinical judgment, mechanistic reasoning, and contextual knowledge (Tonelli, 2006). Critics argue that EBM assumes a naïve empiricism—treating evidence as self-interpreting and independent of theory—an assumption that is incompatible with the theory-ladenness of observation emphasized in contemporary philosophy of science (Worrall, 2002). Others have pointed out that EBM relies on a misleadingly linear model of knowledge translation, as if evidence automatically flows into practice once produced, ignoring the interpretive, technological, and institutional mediations inherent in clinical work (Goldenberg, 2006). Furthermore, some

philosophers contend that EBM implicitly conflates scientific validity with ethical justification, suggesting that what has sufficient evidence is thereby morally required—a position that oversimplifies the complex moral landscape of clinical decisions (Solomon, 2015). Taken together, these critiques reveal that EBM, despite its contributions, rests on epistemological assumptions that do not fully align with the multidimensional, practice-based nature of medicine.

c. Nature of medicine

Medicine, however, is not a natural science but a practice that incorporates biomedical knowledge, technological means, clinical judgment, interpretive understanding, and moral reasoning. Its standards of success—relieving suffering, promoting health, supporting agency, and enabling meaningful care—cannot be reduced to scientific validity alone. Much of what counts as good medical practice depends on context, clinical judgment, and the relational and ethical dimensions of the physician-patient encounter.

Contemporary medicine comprises four interwoven and mutually sustaining domains: biomedical sciences, clinical research, clinical practice, and patient care. Medicine is not merely the application of scientific knowledge; it is a practice whose ultimate aim is the care and healing of patients. Within this practice, biomedical sciences, medical technologies, and the human sciences of medicine all play essential roles, each contributing distinct insights and addressing different dimensions of the patient's condition (Sadegh-Zadeh, 2015).

Consequently, when pseudoscience is applied to medicine, it forces a scientific model onto a multidimensional domain, reducing the complex architecture of clinical action to epistemic categories that were never designed for it. Even if used without exaggeration or hostility, pseudoscience remains structurally incapable of capturing failures of technology, interpretation, communication, ethics, or institutional organization. Its conceptual framework is too narrow to account for the realities of medical practice.

6-2. Practical and Socio-Ethical Dysfunction: The Problematic Effects of the Pseudoscience Label

The second limitation is practical and socio-ethical, concerning how the pseudoscience label functions in real medical discourse. Even if the concept were theoretically

adequate (which it is not), its actual deployment often produces counterproductive outcomes.

In contemporary medicine, the term “pseudoscience” is frequently used as a stigmatizing rhetorical tool rather than a precise analytical category. It can polarize debates, entrench professional hierarchies, and shut down dialogue with non-mainstream practices—including those that, while imperfect or underdeveloped, address dimensions of patient experience not well handled by mainstream medicine. The label may delegitimize patient concerns, create defensive professional attitudes, and contribute to distrust between the public and medical institutions.

Moreover, the pseudoscience discourse tends to conceal internal failures of mainstream medicine by projecting illegitimacy solely onto non-mainstream practices. Issues such as technological malfunction, overdiagnosis, overtreatment, ethical blind spots, and institutional pressures often escape scrutiny because they do not fit within the narrowly epistemic framework of pseudoscience. In this way, the concept can distort the social, cultural, moral, and political landscape of contemporary healthcare.

Thus, the practical limitation of pseudoscience is not merely that it misclassifies some practices, but that it produces harmful social, ethical, and communicative effects within medicine—effects that undermine the very goals of care, trust, and responsiveness that medicine seeks to uphold.

a. Futile Research

The stigmatizing use of the pseudoscience label has also contributed to the proliferation of what might be called low-value research—studies designed primarily to generate minimal empirical signals rather than to develop robust theoretical understanding. When the legitimacy of a field is judged solely by the presence of “evidence,” researchers are incentivized to produce thin, repetitive, and often methodologically weak studies that satisfy evidential checkboxes without advancing explanatory insight or clinical meaning. This phenomenon has been documented widely: [Ioannidis \(2006\)](#) has shown how entire domains of biomedical research become dominated by statistically significant but theoretically trivial findings; [Stegenga \(2018\)](#) argues that medicine’s fixation on evidence production fosters “medical nihilism,” wherein the accumulation of weak evidence replaces genuine progress; and [Horton \(2015\)](#)

warns that the current research ecosystem rewards volume over value. In this climate, pseudoscience rhetoric paradoxically fuels a research culture in which superficial empirical adequacy is mistaken for scientific maturity, thereby undermining both epistemic integrity and the long-term development of meaningful medical knowledge.

a. The Rhetorical Abuse of Philosophy of Science in Medicine

The contemporary debate between mainstream and non-mainstream medicine is marked by a curious and largely unexamined phenomenon: the rhetorical abuse of philosophy of science. Both camps, in defending their epistemic legitimacy, invoke concepts from philosophy of science such as falsifiability ([Popper, 2005](#)), paradigm shifts ([Kuhn, 1997](#)), and epistemological pluralism ([Feyerabend, 2020](#)). Yet these references often function less as tools of critical reflection than as strategies of persuasion and boundary maintenance. In other words, philosophy is not used here as a means of understanding, but as a resource for legitimization—a process that transforms genuine philosophical reasoning into superficial rhetoric.

On the biomedical side, philosophy of science is frequently mobilized to reinforce institutional and epistemic authority. The term pseudoscience, which in Popper’s original framework served to distinguish testable from non-testable claims, has in medical discourse become a rhetorical label of exclusion. [Ernst \(2010\)](#) shows how the language of scientific rationality is often deployed to disqualify non-mainstream or traditional forms of healing without genuine engagement with their empirical or cultural dimensions. Similarly, [Mukerji & Ernst \(2022\)](#) analyze homeopathy as an example of a practice that mimics the rhetoric of science while violating its methodological norms—yet the biomedical response, instead of engaging in critical dialogue, often reduces to stigmatization under the banner of “scientific skepticism.”

This use of “pseudoscience” as an epistemic weapon effectively transforms a philosophical concept into a moral one. It presumes that being non-scientific is inherently irrational or harmful, collapsing the distinction between methodological critique and ethical condemnation. The result is a loss of reflexivity: rather than asking how different forms of knowledge might be evaluated, the debate devolves into a binary of inclusion

and exclusion. In this sense, philosophy of science becomes a discourse of power—its vocabulary used to secure authority rather than to open inquiry.

If philosophy serves as a weapon in biomedicine, it functions as a shield in many forms of non-mainstream medicine. They often selectively draw on concepts such as Kuhn's incommensurability or Feyerabend's epistemological anarchism to reject biomedical standards of validation altogether. [Sharma \(2022\)](#), for instance, describes alternative medicine as representing a “paradigm shift,” implying that its principles are epistemically incommensurable with those of conventional medicine and therefore immune to critique on the basis of clinical trials or statistical inference.

Such appeals misunderstand Kuhn's original insight, which was descriptive rather than normative. Kuhn did not claim that scientific paradigms are incomparably valid, but that they evolve historically through conceptual change. As [Sehon & Stanley \(2003\)](#) demonstrate in their analysis of evidence-based medicine, translating “paradigm” into a justification for epistemic relativism distorts the very logic of philosophical reasoning. Similarly, accusations of “scientism” made by some defenders of homeopathy ([Milgrom & Chatfield, 2012](#)) exemplify how moral critique can replace methodological argument: the philosophical rejection of reductionism becomes a rhetorical strategy for avoiding empirical accountability.

In such cases, philosophy of science is not so much misinterpreted as instrumentalized. Complex theoretical insights are reduced to slogans—“different paradigms,” “beyond empiricism,” “holistic epistemology”—that serve to immunize practices against scrutiny. This rhetorical turn mirrors the biomedical misuse: where one side uses philosophy to silence critique, the other uses it to evade it.

7-A new proposal

Medicine, if it is to fulfill its aims and safeguard its integrity, requires a framework for evaluating its own practices—one that is attuned to both the unique nature of clinical work and contemporary developments in the philosophy of science, the philosophy of medicine, and the philosophy of technology. Any such evaluative framework must therefore resonate with the hybrid character of medicine as a scientific-technological-humanistic practice. As [Monajemi \(2025\)](#) argues in his discussion of TRI-P (the tripartite structure of science,

technology, and interpretive-practical reasoning in medicine), medical judgment unfolds across multiple dimensions that cannot be reduced to a single evidential hierarchy. It is precisely here that Mahner's demarcation model becomes illuminating: by distinguishing failures of science, technology, and the humanities, his framework provides the conceptual resources needed to evaluate medicine in a manner consistent with its multidimensional structure. Integrating this tripartite perspective into medical assessment not only helps protect medicine from epistemic and practical distortions but also establishes a more faithful and philosophically grounded basis for determining what genuinely advances—or undermines—the purposes of medical practice.

7-Tri-P proposal Mahner's model

[Mahner's \(2007; 2013\)](#) tripartite model of epistemic demarcation—distinguishing pseudoscience, pseudotechnology, and pseudo-humanities—offers a highly productive framework for analyzing the complex epistemic landscape of medicine.

Contemporary medicine comprises four interwoven and mutually sustaining domains: biomedical sciences, clinical research, clinical practice, and patient care. Medicine is not merely the application of scientific knowledge; it is a practice whose ultimate aim is the care and healing of patients. Within this practice, biomedical sciences, medical technologies, and the human sciences of medicine all play essential roles, each contributing distinct insights and addressing different dimensions of the patient's condition ([Sadegh-Zadeh, 2015](#)).

Consequently, epistemic distortions may arise at multiple levels: pseudoscience manifests when medical theories or therapies lack empirical grounding; pseudotechnology appears in devices and procedures that mimic technological legitimacy through sophisticated design or jargon—but lack verified efficacy, safety, or technical validity. Examples include so-called “energy healing machines” or “frequency diagnostic” devices; and pseudo-humanities emerge in psychological, sociological, ethical, or philosophical discourses that borrow the rhetoric of the humanities without theoretical or methodological rigor, often serving to legitimize popular or commercial discourses about well-being or self-improvement.

Although Mahner's tripartite model—distinguishing pseudoscience, pseudotechnology, and

pseudohumanities—offers a valuable structure, it requires an additional layer to be entirely adequate for medicine. What medicine needs is the overarching category of *pseudo-practice*, a concept that allows all three domains to be assessed in relation to the practical ends of medicine itself. The decisive criterion here is whether a practice—scientific, technological, or humanistic—advances or undermines the telos of clinical care. As Fuller emphasizes in his recent work on demarcation, pseudo-practice captures precisely those forms of failure that cannot be reduced to epistemic shortcomings alone but arise from ethical, technological, or institutional distortions within a practice. (Fuller, 2024). Integrated with Mahner's schema, this concept provides a more faithful and practice-oriented framework for evaluating medical legitimacy.

Pseudo-practice can be understood as a mode of professional or clinical conduct that mimics the outward appearance of legitimate medical practice while undermining its internal rationality and ethical aims.

Appears practical but lacks the essential features of good practice: responsiveness to the patient's situation, proportionality of intervention, and critical reflection on evidence and values. In mainstream medicine, pseudo-practice may occur when procedures are performed mechanically, driven by technological protocols or financial incentives rather than clinical judgment or patient welfare. The best examples are forms of medicalization, such as overdiagnosis, overtreatment, or cosmetic interventions. In non-mainstream medicine, pseudo-practice may take the form of ritualized or symbolic acts presented as healing, but without empirical grounding or ethical responsibility toward outcomes. In both cases, the problem is not belief but performance: a disjunction between what practice claims to be and what it actually achieves. Hence, just as pseudoscience simulates epistemic validity, pseudo-practice simulates ethical and professional validity (Figure 1).

Pseudo-practice

Pseudo-
Science

Pseudo-
Technology

Pseudo-
Humanities

Figure 1

3M model as a framework for evaluation

10- Pseudo-Humanities and the Need for Reflexive Philosophy

Applying Mahner's model reveals that much of the polemical debate between mainstream and non-mainstream medicine is itself a form of pseudohumanities. The symmetrical misuse of philosophy of science on both sides can be understood as a form of pseudo-humanities—that is, the imitation of

philosophical or critical reasoning without its epistemic rigor or self-reflective openness.

In biomedical discourse, pseudo-humanities emerge when philosophical ideas are invoked to naturalize institutional authority. In alternative medicine, they appear when philosophical relativism replaces empirical or ethical responsibility. In both cases, the result is the loss of philosophy's critical function.

What is needed, therefore, is a reflexive philosophy of medicine—one that restores philosophy's diagnostic, not ideological, role. Such a philosophy would neither defend mainstream medicine uncritically nor romanticize its alternatives. Instead, it would examine how philosophical concepts are mobilized, distorted, or co-opted in medical discourse, and under what conditions they regain their critical force.

Within this reflexive framework, philosophy ceases to be an instrument of validation or defense. It becomes a tool for understanding how knowledge claims—

scientific, practical, or ethical—achieve or lose epistemic validity (Mahner, 2007).

This approach resonates with the broader project of double critique developed in this study: to expose not which side of the debate is correct, but how both can become epistemically corrupt when they cease to be self-critical. By analyzing the rhetorical abuse of philosophy of science, we accept philosophical reasoning; we reclaim it for the practice of critical reflection that medicine—and the discourse surrounding it—urgently requires (Table 2).

Table 2

Pseudo-practice, pseudo-science, pseudo-technology, and pseudo-humanities in medicine

Category	Examples in Medicine	Relevant Evaluation Criteria
Pseudo-practice:	Over-Medicalization Overdiagnosis and overtreatment Defensive medicine Industry-driven care pathways	Alignment with medicine's telos (care, healing, protection) Ethical justification (autonomy, beneficence, justice), Clinical meaningfulness
Pseudoscience: Claims without empirical support	Institutional practices that undermine patient agency Use of outdated or falsified biological mechanisms Theoretical incoherence in biomedical claims Misuse of scientific concepts to justify therapies	Good Consequences for patients and society. Integration of scientific, technological, and humanistic components Empirical adequacy (evidence, reproducibility) Theoretical coherence
Pseudotechnology: Devices lacking adequate safety and functionality	Algorithms or AI tools with opaque or unreliable performance Overpromised digital therapeutics Diagnostic tests with poor sensitivity/specificity	Mechanistic plausibility, Methodological rigor, Progressiveness of research program Technical reliability (accuracy, safety, robustness) Usability and contextual appropriateness
Pseudohumanities: Misuse of humanities concepts	Rhetorical appeals to "nature" or "tradition" without grounding. Overinterpretation of narratives without clinical relevance	Risk-benefit proportionality and engineering standards Implementation monitoring Interpretive validity Conceptual clarity Ethical coherence Consistency with patient experience Avoidance of rhetorical fallacies

To fully grasp Mahner's tripartite model, one must move beyond the philosophy of science and engage with the philosophy of medicine, which addresses both the ontological nature of medicine and its relation to power and institutional authority. Philosophy of medicine investigates whether medicine is a science or a scientific practice, how clinical judgment operates under conditions of uncertainty, and how medical knowledge interacts with ethical, social, and political structures. From this standpoint, Mahner's model gains depth along two philosophical axes:

1. The ontological axis, which situates medicine as a practical, interpretive, and moral enterprise rather than a purely theoretical science; and
2. The critical axis, which exposes how medical knowledge and its pseudo-forms are entangled with power, economic interests, and cultural authority.

Thus, the philosophy of medicine provides the necessary framework for interpreting pseudoscience, pseudo-technology, and pseudo-human sciences not

merely as epistemic deviations but as phenomena embedded in the broader dynamics of knowledge, practice, and power. It transforms Mahner's model from a tool of epistemic demarcation into a foundation for critical medical philosophy.

If the philosophy of medicine is to serve as a genuinely critical discipline, its task cannot be limited to exposing the epistemic flaws of complementary and alternative medicines (CAM). It must also turn its gaze toward biomedicine itself, interrogating its claims to universality, neutrality, and scientific objectivity. While CAM practices often exemplify Mahner's categories of pseudoscience, pseudo-technology, or pseudo-humanities, mainstream medicine is not exempt from critique: it can become ideologically "pseudo" whenever it privileges technological or economic imperatives over human meaning, ethics, and lived experience.

A comprehensive philosophy of health must therefore practice a double critique—one that challenges both the epistemic deficiencies of alternative healing systems and

the institutionalized power structures of biomedicine. In this sense, critical philosophy of medicine transforms Mahner's demarcation framework into a broader inquiry into the politics of knowledge, revealing how all medical practices—orthodox or alternative—are shaped by the interplay of science, technology, and power.

Building on these insights, Mahner's framework, when interpreted through the lens of the philosophy of medicine, provides a comprehensive epistemological and critical tool for analyzing the health domain. It reveals that medicine, technology, and the humanities are co-produced fields of knowledge whose boundaries are fluid and contestable. Understanding pseudoscience in health, therefore, requires acknowledging not only the limits of evidence but also the politics of knowledge—how claims to truth and authority are negotiated, legitimized, and resisted within the contemporary health landscape.

12-The Philosophical Function of Double Critique

Suggest another word instead of scientism.

It is precisely here that the philosophical significance of double critique becomes evident. If non-mainstream is itself a product of the scientistic worldview it purports to resist, then a single, one-directional critique—whether aimed only at pseudoscience or only at biomedical orthodoxy—is epistemologically insufficient. A double critique requires the simultaneous examination of both poles of modern medical rationality: the technoscientific reductionism of biomedicine and the reactive, pseudoscientific romanticism of non-mainstream approaches. This dual analysis exposes the symbiotic relationship between these two forms of knowledge, showing how each reproduces the other's blind spots and legitimizing strategies (Foucault, 1972; Mahner et al., 2013).

Through double critique, the philosophy of medicine transcends the binary opposition of "science versus pseudoscience". Instead, it reveals the shared epistemic ground that allows both to flourish under the regime of scientism. The goal, therefore, is not to replace one paradigm with another, but to uncover the conditions of possibility of both—their mutual dependence on the idea that a scientific form of evidence must authorize medical truth. In this sense, double critique functions as a philosophical method of emancipation: it opens space for a genuinely humanistic and reflective understanding of

medicine that neither denies science nor worships it (Greenhalgh et al., 2014; Solomon, 2015).

Given the arguments developed throughout this paper, it seems more appropriate to speak not of demarcation but of a more practice-sensitive evaluative framework—validation may be the more fitting term. Now that we have arrived at the contours of such a framework, albeit one that still requires further refinement, two philosophical tasks emerge as central to the philosophy of medicine. First, we must critically examine the polemical exchanges between mainstream and non-mainstream practitioners, many of which amount to a kind of pseudo-humanities, especially in the public sphere. Second, we must clarify the locus of the dispute, as a recurring problem in these debates is the conflation of distinct levels of inquiry: which evaluative criteria are being invoked, and at what level—scientific, technological, clinical, ethical, or institutional? Sorting out these levels is essential if the discussion is to move beyond rhetorical entanglement toward a more reflective and productive form of medical critique.

13-Levels of Engagement in the Debate on Pseudoscience and Validation in Medicine

The problem of pseudoscience in medicine operates across several interrelated levels of discourse, each governed by distinct goals, actors, and standards of validity. Recognizing these levels helps to explain why the application of the pseudoscience label is inconsistent and why a more plural and reflexive notion of validation is required. The double critique proposed in this paper works across all these levels, aiming to scrutinize both mainstream and non-mainstream medicine under differentiated but equally rigorous criteria.

At the theoretical-philosophical level, philosophers of science debate what counts as scientific rationality in medicine. Thinkers such as Popper, Lakatos, and Mahner provide distinct frameworks for distinguishing legitimate science from its pseudo-forms. The double critique at this level reveals two kinds of error: on one side, an uncritical scientism that reduces medicine to experimental verification; on the other, a misuse of philosophy—often invoking Kuhnian incommensurability—to justify the rejection of empirical standards. Both extremes represent pseudo-humanities: distortions of philosophical reasoning in service of ideological aims.

At the methodological-research level, validity concerns the structure and hierarchy of evidence. Evidence-based medicine (EBM) sets rigorous empirical standards through randomized controlled trials and meta-analyses. Yet, while EBM justly criticizes poorly supported interventions such as homeopathy or energy healing as pseudoscience, it can itself fall into a form of methodological dogmatism when it dismisses qualitative, contextual, or patient-reported forms of evidence. The double critique here exposes both the empirical weaknesses of untested CAM practices and the epistemic narrowness of an overly positivist EBM.

At the pragmatic-clinical level, the question of validation shifts from data to practice. Practitioners must integrate empirical evidence with ethical responsibility, narrative understanding, and patient experience. Here, pseudo-practice arises when clinical behavior is presented as scientific yet neglects moral reasoning or situational judgment—such as the unreflective application of algorithms detached from lived care. Conversely, specific alternative approaches may achieve practical validation by fostering meaning and well-being even when theoretical explanations remain uncertain. The double critique at this level balances scientific accountability with clinical wisdom.

At the institutional-policy level, validity becomes a question of governance and legitimacy. Health authorities and funding bodies define what constitutes recognized medicine through licensing, reimbursement,

and research policies. The creation of the U.S. National Center for Complementary and Integrative Health (NCCIH) illustrates how demarcation serves as a policy tool for inclusion and exclusion. The double critique here interrogates both the bureaucratic inertia of medical institutions that monopolize legitimacy and the strategic appropriation of “science” by interest groups seeking recognition without adequate validation.

Finally, at the public level, the boundaries of science and pseudoscience are negotiated through discourse, trust, and communication. Public controversies—ranging from vaccine skepticism to “natural medicine” movements—demonstrate that pseudoscience often functions as a rhetorical label mobilized to assert or resist authority. The double critique here challenges both the technocratic dismissal of public concerns and the populist manipulation of public distrust of science. Proper validation at the public level depends on transparency, humility, and the ethical cultivation of trust between medicine and society.

Taken together, these five levels show that pseudoscience in medicine is not a single epistemic error but a multi-level phenomenon of cognitive, institutional, and communicative imbalance. The philosophy of validation thus calls for a reflexive, plural, and dialogical framework that sustains critique across all domains where medical knowledge is produced, practiced, and believed (Table 3).

Table 3

Levels of Engagement in the Evaluative Debate and the Role of Double Critique

Level	Main Actors	Core Question	Criteria of Validation	Focus of Double Critique
1. Theoretical-Philosophical	Philosophers of science and technology, philosophers of medicine, epistemologists	What counts as scientific rationality in medicine?	Conceptual coherence, epistemic soundness, and philosophical rigor	Uncritical scientism vs philosophical misuse (e.g., appeals to incommensurability to reject empirical evidence)
2. Methodological-Research	Biomedical researchers, EBM scholars, clinical scientists	How can validity be operationalized in medical research?	Experimental rigor, reproducibility, transparency	Methodological dogmatism of EBM vs empirical weakness of untested NMS practices
3. Pragmatic-Clinical (Practice)	Clinicians, health professionals, and medical ethicists	How should evidence be integrated into patient care?	Professional judgment, ethical reflection, contextual appropriateness	Algorithmic overreliance in mainstream care vs anti-empirical intuitionism in alternative care
4. Institutional-Policy	Health ministries, regulators, funding bodies, and accreditation agencies	How should medicine be defined, legitimized, and governed?	Institutional accountability, regulatory standards, and the fairness of inclusion/exclusion	Institutional monopoly on legitimacy vs strategic scientism used for policy access by NMS groups

5. Public (Discourse and Trust)	Patients, media, advocacy groups, and the general public	How is medical legitimacy constructed and contested publicly?	Credibility, transparency, communicative trust, and ethical communication	Technocratic disregard for public understanding vs populist exploitation of scientific distrust
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Discussion and Conclusion

Since the rise of Greek rational medicine, the medical profession has sought both to justify the effectiveness of its interventions and to guard against fraudulent practices. Although the modern discourse on pseudoscience continues this historical impulse, its use in contemporary medicine is often counterproductive. Even when motivated by sincere ethical concerns, the label "pseudoscience" rests on an overly reductionist epistemology that prioritizes empirical verification while ignoring the moral, contextual, and experiential dimensions of clinical practice. This narrowing risks epistemic blindness, obscuring legitimate forms of medical reasoning that do not fit a strict natural-scientific mold. Moreover, the rhetorical deployment of "pseudoscience" frequently backfires, intensifying polarization between biomedical and non-mainstream healers and eroding public trust. As critics such as Thagard and Resnik argue, medical legitimacy requires conceptual flexibility and contextual judgment rather than static boundary-drawing. Thus, for all its good intentions, the pseudoscience framework may inadvertently reproduce the very harms it aims to prevent. A shift toward a validation-based approach offers a more ethically vigilant and context-sensitive alternative.

The contemporary discourse on pseudoscience in medicine has taken a direction that disproportionately targets CAM, even though many interventions in mainstream medicine are difficult to justify. A striking example is medicalization, which consumes a substantial portion of global health budgets each year. As Conrad et al. (2010) analyses demonstrate, medicalization has expanded far beyond pathology, colonizing ordinary life processes and generating enormous economic and institutional burdens. When viewed through the 3M model, it becomes evident that most unwarranted claims in medicine are not primarily instances of pseudoscience but rather forms of pseudo-technology and pseudohumanities. Moreover, some of these failures have escalated to the level of pseudo-practice, the most significant of which is medicalization itself.

No evaluative framework can claim completeness, and the model proposed here—distinguishing pseudoscience, pseudo-technology, pseudo-humanities, and the overarching category of pseudo-practice—must likewise be approached with a sense of its own limitations. The concept of practice, for example, may appear too expansive to serve as an organizing principle for medicine. Yet, its breadth reflects the very heterogeneity of medical work and the plurality of domains in which failure can occur. Similarly, anchoring assessment in the telos of medicine does not presume a rigid or universal definition of its aims; instead, it draws on a historically durable constellation of moral commitments that orient clinical action. The proposed distinctions are not without ambiguity, and further philosophical refinement is undoubtedly required, particularly regarding the boundaries between technological failure, interpretive distortion, and epistemic invalidity. What the model offers at this stage is not a final taxonomy but a more generous and practice-sensitive lens—one that avoids the reductive tendencies of the pseudoscience framework and makes room for the many ways in which medicine can falter, not only in knowledge but in care. If the argument here has any force, it is that medicine requires an evaluative vocabulary capable of acknowledging its scientific, technological, humanistic, and moral dimensions together. The concept of pseudo-practice is an attempt to gesture in that direction, inviting further debate, refinement, and collaborative inquiry rather than closure.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Declaration of Helsinki, which provides guidelines for ethical research involving human participants. Ethical considerations in this study included the fact that participation was entirely optional.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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