Review Article

Archives of Clinical Case Reports and Reviews

Does Clinical Semiology Still Matter? Evidence for the Primacy of History and Physical Examination in Modern Medicine, with a Focus on the Future Central Role of Internists

Emmanuel Andrès, M.D., Ph.D., Noel Lorenzo-Villalba, M.D.

From the Service de Médecine Interne, Hôpital de Hautepierre, Hôpitaux Universitaires de Strasbourg (HUS), and EA 3072 Faculté de Médecine, Université de Strasbourg, Strasbourg, France.

***Correspondence Author:**
Emmanuel Andrès, M.D., Ph.D., Service de Médecine Interne, Hôpital de Hautepierrre, Hôpitaux Universitaires de Strasbourg, 1 Avenue Molière, 67091 Strasbourg Cedex, France (E-mail: emmanuel.andres@chru-strasbourg.fr).

Citation: Emmanuel Andrès, Noel Lorenzo-Villalba. Does Clinical Semiology Still Matter? Evidence for the Primacy of History and Physical Examination in Modern Medicine, with a Focus on the Future Central Role of Internists. *Arch Clin Case Rep Rev*. 2026; 1(1), 01-10.

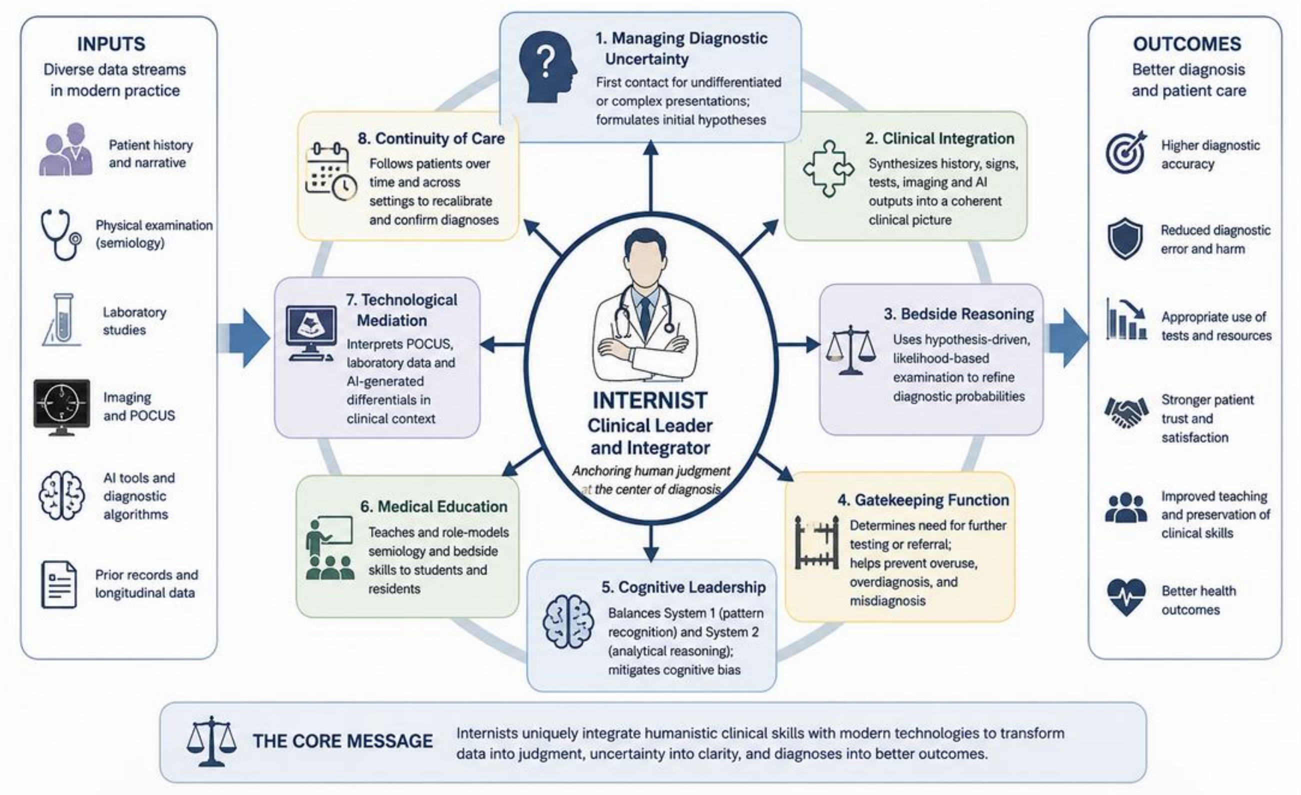
Received Date: 20 June 2026 **Accepted Date:** 30 June 2026 **Published Date:** 10 July 2026

Abstract

Clinical semiology — the art and science of gathering and interpreting clinical signs and symptoms — has been practised since antiquity, yet its role in modern medicine is increasingly questioned in the era of sophisticated imaging, laboratory analytics, and artificial intelligence (AI). In this review, we present evidence that history taking and physical examination remain the cornerstone of the diagnostic process, accounting for approximately 76–82% of diagnoses in primary and secondary care settings. We examine the diagnostic accuracy and likelihood ratios of key clinical signs across major organ systems, discuss the consequences of declining bedside skills on diagnostic error rates, and explore how contemporary tools — including point-of-care ultrasonography (POCUS) and AI-assisted decision support — should complement rather than supplant semiological competence. We further highlight the pivotal and expanding role of internists, who, at the interface of primary and specialized care, are uniquely positioned to preserve, integrate, and advance clinical semiology in complex diagnostic reasoning. We conclude that semiology is irreplaceable, both as a diagnostic technology and as the foundation of the therapeutic physician–patient relationship, and propose a framework for its renaissance in 21st-century medical education and practice.

Keywords: Semiology; Modern medicine; Evidence-based medicine; Physical examination; Medical history; Point-of-care ultrasonography; Artificial intelligence.

Graphical Abstract



Introduction

The word 'semiology' derives from the Greek semeion (sign) and logos (study): the systematic study of the signs and symptoms of disease. For most of recorded medical history — from Hippocratic case reports to the bedside teaching of Laënnec and Osler — semiology represented the totality of medical reasoning. 1-3 Today, the landscape has been transformed by computed tomography, magnetic resonance imaging, next-generation genomics, high-sensitivity biomarkers, and, most recently, large language model–based artificial intelligence (AI). 4-11 Paradoxically, this abundance of diagnostic technologies has fueled doubt about whether clinicians still need to look at, listen to, and touch their patients. 7-11.

The concern is not merely academic. Bedside teaching time has fallen from approximately 75% of clinical training in the 1960s to fewer than 16% by the 1990s, and recent estimates place it between 8% and 19% at best. 12 A 2017 survey of 2,684 practicing clinicians found that 66% of trainees reported never being observed by a consultant during physical examination, and 31% reported that consultants never demonstrated semiological technique. 3 These figures represent a structural erosion of the foundational skill set that clinicians use to guide every subsequent diagnostic and therapeutic decision.

At the same time, evidence consistently demonstrates that a well-conducted clinical history and physical examination yield the correct diagnosis in the large majority of encounters without recourse to advanced investigations. 4-6 Internists occupy a central and irreplaceable role within this landscape. As diagnostic generalists managing medically complex and undifferentiated patients, they are uniquely trained to synthesize semiological findings with evolving technological data, ensuring diagnostic coherence in situations of uncertainty. Their practice sits at the interface of multiple specialties, making them key custodians of clinical reasoning and the integration of bedside medicine with modern diagnostic technologies. More broadly, internists are positioned to lead the preservation and renewal of semiology in both clinical practice and medical education.

This review synthesizes that evidence, quantifies the diagnostic performance of key clinical signs, examines the consequences of semiological decline, and argues for the integration — not substitution — of semiology within modern medicine.

Historical Perspective And Conceptual Framework

The landmark study by Hampton and colleagues, published in the British Medical Journal in 1975, quantified for the first time the differential contribution of clinical data sources to diagnosis (Table 1). 7 Among 80 consecutive new medical outpatients, a diagnosis consistent with the final diagnosis was reached after history alone in 66 cases (82.5%); physical examination added a further seven diagnoses (8.8%), and laboratory investigation the remaining seven (8.8%). These proportions have been remarkably consistent across subsequent international replications spanning five decades.

Peterson et al. studied 80 patients in a US outpatient unit, finding that history contributed to 76% of final diagnoses, physical examination to 12%, and laboratory investigation to 11%. 8 Roshan and Rao reported near-identical figures in an Indian tertiary cohort: history 78.6%, physical examination 8.2%, laboratory 13.2%. 9 A concurrent Brazilian dataset replicated this pattern: 77.8%, 10%, and 10% respectively (unpublished data cited by Benseñor et al.).

These convergent data across diverse health systems and populations suggest that the contributions of history and physical examination are not artefacts of a particular clinical culture but biologically grounded: the patient's narrative encodes the temporal and physiological trajectory of disease in ways that no single biomarker can fully replicate.

Table 1. Relative Contributions of History, Physical Examination, and Laboratory Investigation to Diagnosis: Summary of Key Studies

Study (Year)	Country	N	History (%)	Phys. Exam (%)	Lab (%)
Hampton et al. (1975)	UK	80	82.5	8.8	8.8
Sandler (1979)	UK	630	56	—	—
Peterson et al. (1992)	USA	80	76	12	11
Roshan & Rao (2000)	India	100	78.6	8.2	13.2
Benseñor et al. (unpublished)	Brazil	—	77.8	10	10

Phys. Exam = physical examination; Lab = laboratory investigation. Sandler (1979) did not report physical examination separately. Dashes indicate data not available.

Semiology As The Engine Of Clinical Reasoning

Dual-Process Cognition and the Semiological Encounter

Clinical diagnosis operates through two cognitive modes first formalized for medicine by Croskerry. 10 System 1 — fast, pattern-recognition–based, largely unconscious — allows the experienced clinician to identify Cushing's disease at a glance, recognize a typical myocardial infarction from a description of retrosternal pressure radiating to the left arm, or detect a mitral regurgitation murmur during a cardiac examination. System 2 — slow, analytical, hypothesis-driven — provides the deliberate logic that generates and tests differential diagnoses. Croskerry and Norman identified more than 40 cognitive biases capable of corrupting both systems. 11 Crucially, both systems are anchored in semiological data: without adequate history taking and physical examination, neither System 1 pattern recognition nor System 2 analytical reasoning has adequate input.

The hypothetico-deductive model — in which clinicians generate early diagnostic hypotheses from the first few seconds of the clinical encounter and then refine them through targeted questioning and focused examination — is the dominant framework of expert clinical reasoning. 12 In this model, the clinical history generates the initial probability distribution across competing diagnoses, and the physical examination applies likelihood ratios that shift those probabilities towards or away from each diagnostic hypothesis.

Likelihood Ratios: Quantifying Semiological Accuracy

A likelihood ratio (LR) is the ratio of the probability of a given clinical finding in those with the disease to its probability in those without. Positive LRs (LR+) above 10 and negative LRs (LR−) below 0.1 are considered highly informative and substantially alter post-test probability. 13 The McGee evidence-based physical diagnosis framework (4th edition, 2018) and the JAMA Rational Clinical Examination series have systematically catalogued LRs for hundreds of clinical findings across virtually all organ systems 13,14.

Selected high-value clinical signs with robust LRs are summarized in Table 2. Importantly, individual signs are more powerful when embedded in clinical clusters: systematic reviews of low back pain diagnosis demonstrated that single clinical tests rarely achieved LR+ > 2, whereas clusters of tests produced clinically meaningful probability shifts 15.

Table 2: Selected Clinical Signs and Their Likelihood Ratios

Clinical Sign	Condition	LR+ (95% CI)	LR− (95% CI)	References
Diminished A2 (aortic closure)	Aortic stenosis ≥ moderate	10.87 (3.94–30.12)	—	PMID 35820657
Slow-rising carotid pulse	Aortic stenosis ≥ moderate	9.2 (2.3–35.9)	0.3 (0.1–0.6)	PMID 35820657
Conjunctival pallor	Severe anemia (Hb < 9 g/dl)	4.49 (1.80–10.99)	0.61 (0.44–0.80)	PMC11020582
Absence of snuffbox tenderness	Scaphoid fracture (rule out)	—	0.10–0.15	PMC6947988
Shifting dullness	Ascites	5.0 (2.5–10.3)	0.4 (0.3–0.6)	McGee 2018
Fluid wave	Ascites	9.7 (3.3–28.9)	0.4 (0.2–0.7)	McGee 2018
Crackles on auscultation	Pneumonia (in dyspnea)	~3.5	~0.4	PMID 29196348
Subjective clicking (Morton)	Morton neuroma	13.14	Low	PMC11574893
Pelvic instability on exam	Pelvic fracture (Se 85.9%)	Variable	0.15	PMC7531119

LR+ = positive likelihood ratio; LR− = negative likelihood ratio; Se = sensitivity; Ci = confidence interval; Hb = hemoglobin.

The Decline Of Bedside Skills: Scope And Consequences

The Epidemiology Of Semiological Erosion

The erosion of bedside teaching is well-documented. An observational study at Brigham and Women's Hospital found that physical examination techniques were demonstrated to trainees in only a minority of attending rounds. 16 Faustinella and Jacobs described a multifactorial phenomenon: increased patient turnover, electronic health record demands, and progressive substitution of clinical judgment by laboratory and imaging tests. 17 A systematic review confirmed that bedside teaching declined from 75% of clinical training in the 1960s to 8–19% by the 2010s.1.

The consequences for diagnostic accuracy are concrete. A comprehensive systematic review of diagnostic errors in the emergency department reported that diagnostic error rates ranged from 1.5% for myocardial infarction to 56% for spinal epidural abscess, with a global average of 5.7% across all conditions. 18 Stroke — the leading cause of serious misdiagnosis-related harm — is missed in approximately 17% of ED encounters; this rate rises to 40% among patients presenting with dizziness or vertigo, increasing diagnostic error odds 14-fold relative to patients with focal motor deficits.

In primary care, Gandhi et al. conducted one of the largest studies of ambulatory diagnostic error, analyzing 190 cases with missed diagnoses across 68 unique conditions. Breakdowns in the patient-practitioner clinical encounter were identified in 78.9% of cases; within these, 56.3% involved deficiencies in history-taking, and 47.4% in physical examination 19.

Operational Consequences: Over-investigation and Cost

When semiological skill is absent, clinicians compensate with diagnostic tests, driving over-investigation and healthcare costs. Estimates suggest that approximately 30% of healthcare spending in high-income countries may be attributable to low-value care, much of it driven by inappropriate diagnostic testing. 20 A comprehensive history and targeted physical examination serve as the primary gate-keeping mechanism that determines which patients genuinely require advanced investigations.

Bedside teaching, far from being a luxury, is the educational mechanism through which clinicians develop the judgment that underpins cost-appropriate care. The hypothesis-driven physical examination framework, in which examination maneuvers are selected for their LR characteristics, provides a structured educational approach to preserving this gate-keeping function in an evidence-based manner. 21.

Semiological Accuracy Across Organ Systems

Cardiovascular System

Cardiac auscultation was historically regarded as a defining clinical competence and its quantitative value has been rigorously evaluated. A 2022 systematic review and meta-analysis evaluating physical examination for moderate-to-severe aortic stenosis pooled 7 observational studies. Auscultating a diminished second heart sound (A2) achieved LR+ = 10.87 (95% CI 3.94–30.12), and palpating a delayed carotid upstroke achieved LR+ = 9.2 (95% CI 2.3–35.9). 22 The same review demonstrated a LR− = 0.3 (95% CI 0.1–0.6) for absence of a slow-rising pulse, conferring substantial rule-out power.

Tavel reviewed cardiac auscultation across a broad range of conditions and concluded that — far from being obsolete — it retained a 'glorious future' as a screening modality capable of selecting appropriate patients for echocardiography, reducing unnecessary referrals. 23 The 2017 survey by Turner et al. confirmed that 70% of 2,684 clinicians rated physical examination as 'almost always valuable' in acute medical admissions, with auscultatory signs for pulmonary wheezes and crackles rated most frequently used and useful. 3.

Abdominal Examination

Ascites detection remains one of the highest-yield bedside maneuvers. McGee's meta-analyses (4th edition, 2018) demonstrated that a positive fluid wave has LR+ = 9.7 (95% CI 3.3–28.9) and shifting dullness LR+ = 5.0 (95% CI 2.5–10.3) for ascites. 13 These figures compare favorably with many laboratory biomarkers for hepatic disease.

A prospective study from Olson et al. assessed detection of splenomegaly in 39 hospitalized patients against CT/MRI/ultrasound gold standards, finding that traditional physical examination achieved sensitivity of only 40% (95% CI 12–77%) and specificity of 94% (95% CI 79–99%), confirming that palpation for splenomegaly is better as a rule-in than a rule-out test. Point-of-care ultrasound (POCUS) significantly improved sensitivity in the same study, illustrating the complementary relationship between semiology and bedside technology. 24.

Musculoskeletal and Locomotor Examination

The diagnostic accuracy of musculoskeletal semiology is markedly examination-test dependent. For scaphoid fracture, pooled data from systematic reviews found that the absence of anatomical snuffbox tenderness achieved LR− = 0.10–0.15, providing strong rule-out performance. 25 For thumb osteoarthritis, physical examination showed sensitivity 2–100% and specificity 75–100% across five studies, with the adduction test, extension test, and metacarpal pressure-shear test each achieving accuracy above 90% in at least two studies. 26.

For Morton neuroma, a 2024 systematic review found that patient-reported subjective clicking carries specificity of 0.96 and LR+ = 13.14, while the modified webspace tenderness test achieves sensitivity of 0.96. 27 These data demonstrate that, for specific conditions, targeted semiological tests can approach the accuracy of more expensive investigations.

Hematological and General Examination

Conjunctival pallor assessment for anemia has been validated across multiple studies. Sheth et al. found that the presence of conjunctival pallor achieves LR+ = 4.49 (95% CI 1.80–10.99) for severe anemia (hemoglobin < 9 g/dL), while its absence reduces probability with LR− = 0.61 (95% CI 0.44–0.80). 28 Although interobserver agreement is moderate for mild anemia, the clinical sign retains important utility as a low-cost, universally accessible screening tool, particularly in resource-limited settings.

Extending Semiology: Telemedicine And Point-Of-Care Ultrasound

Virtual Clinical Examination

The COVID-19 pandemic accelerated telemedicine adoption and forced a critical re-evaluation of which examination components can be adapted to synchronous video formats. A systematic review by Lu et al. analyzed 64 studies across five clinical domains. 29 The most extensively studied element was cognitive assessment, where virtual Mini-Mental Status Examination showed high reliability across multiple settings. Overall, virtual assessments performed similarly to in-person components for diagnostic accuracy, though with wide variability in interrater reliability and small sample sizes (typically < 50 participants per study). The authors concluded that semiology remains feasible via telemedicine for selected components, but that complete substitution of in-person examination is not currently supportable by evidence.

POCUS as Semiological Extension

POCUS is best conceptualized not as a replacement for clinical examination but as a 21st-century extension of it — the 'visual stethoscope'. A 2022 study demonstrated that POCUS as an adjunct to physical examination in patients with bacteremia or candidemia identified clinically significant findings — including infective endocarditis and deep abscess collections — that standard examination had missed, without requiring the patient to leave the bedside. 30 Similarly, a 2021 case report in nephrology illustrated how POCUS-extended physical examination detected cardiac amyloidosis in an oligosymptomatic patient with nephrotic syndrome 31.

The cardiopulmonary applications of POCUS are particularly well-established. Lung ultrasound outperforms chest radiography and physical examination for detecting pulmonary oedema, and the Venous Excess Ultrasound (VExUS) score provides structured assessment of systemic venous congestion through abdominal venous Doppler patterns. 32 However, the diagnostic value of POCUS is fully realized only when the operator possesses a robust clinical hypothesis — itself generated by antecedent history taking and physical examination — that guides probe placement and image interpretation.

Artificial Intelligence And Clinical Semiology: Synergy Or Substitution?

Large language models (LLMs) capable of processing clinical vignettes and generating differential diagnoses have attracted intense interest. A 2024 systematic review and meta-analysis by Ueda et al. analyzed 83 studies validating generative AI for diagnostic tasks (June 2018–June 2024), finding an overall diagnostic accuracy of 52.1%. 33 No significant performance difference was found between AI models and non-expert physicians ($p = 0.93$), but AI performed significantly worse than expert physicians ($p = 0.007$).

Rodman et al. directly compared AI and clinician performance in estimating pre- and post-test probabilities, finding that LLM performance was stronger for pre-test probability estimation than for post-test probability revision after positive results, suggesting a specific limitation in the contextualized Bayesian reasoning that underpins clinical examination interpretation 34.

A critical limitation of LLM-based diagnosis is the complete dependence on textual inputs: AI systems cannot auscultate, palpate, percuss, or observe. All published AI diagnostic studies rely on physician-generated semiological data as their primary input. In this sense, AI amplifies rather than replaces semiology: an AI that receives rich, accurate, structured clinical data will outperform one receiving impoverished inputs. 35 The clinical implication is that maintaining and improving semiological competence is a prerequisite for effective AI-assisted medicine, not an alternative to it.

Furthermore, AI systems are not immune to the cognitive biases that affect human reasoning. LLMs replicate anchoring, premature closure, and availability bias present in their training data. 36 A human clinician with sophisticated semiological skills provides the quality-control layer that can detect discordance between AI suggestions and bedside findings — precisely the complementary function that optimizes diagnostic performance.

Rebuilding Semiological Competence: Educational Perspectives

Current State Of Bedside Teaching

Bedside teaching is widely recognized as the optimal environment for developing integrated semiological skills: history taking, physical examination, clinical reasoning, communication, and professionalism are all practized simultaneously. 37 An Objective Structured Clinical Examination (OSCE) program at the University of Minho documented seven years of structured assessment of these competencies, demonstrating that systematic, standards-referenced evaluation is feasible and can drive sustained improvement. 38.

A key educational intervention is the hypothesis-driven physical examination framework, which reframes bedside examination from a ritualistic head-to-toe survey into a targeted probability-modifying strategy. 39 By selecting maneuvers with established LRs that are relevant to the leading hypotheses generated by the history, this approach enhances both the clinical yield and the educational salience of physical examination. Its explicit framing in terms of Bayesian probability makes it legible to students trained in evidence-based medicine (EBM).

Dual-process theory and cognitive bias curricula further enrich semiological education. Choi et al. demonstrated that explicit teaching of System 1/System 2 theory and cognitive biases to first-year medical students was associated with improved self-reported awareness of diagnostic errors, laying a conceptual framework for life-long semiological vigilance 40.

Competency Frameworks and Institutional Responses

Multiple international bodies — including the American College of Physicians, the Royal Colleges of Physicians, and the European Federation of Internal Medicine — have articulated frameworks for the preservation of clinical skills. These frameworks emphasize that clinical competence is not binary but a practiced skill requiring regular demonstration, feedback, and formative assessment throughout a career.

Semiology And The Therapeutic Physician–Patient Relationship

Beyond its diagnostic function, the clinical encounter has inherent therapeutic value. The physical examination, in particular, communicates care, attention, and technical competence to the patient in ways that questionnaires and laboratory reports cannot. 41 A survey of patient expectations (PMC7085258) found that patient perception of their primary care physician was strongly associated with the number of physical examination maneuvers recalled during annual visits, and that even low-cost maneuvers — palpation of lymph nodes, ophthalmoscopy, percussion — substantially enhanced patient satisfaction and trust 42.

Derse re-examined the physician–patient relationship in the digital era, arguing that it remains a moral and therapeutic foundation of medicine that no technological intermediary can replicate. 43 Trust in the physician, which is strongly associated with treatment adherence, satisfaction, and clinical outcomes, is built in part through the physical encounter — through touch, eye contact, and the manifest skill of the examination. Studies have shown that patients who trust their physician are significantly more likely to adhere to prescribed treatments ($p < 0.001$ in national surveys), reducing hospitalizations and downstream healthcare costs 44.

Keller et al. articulated the distinction between the ‘personal’ and ‘factual’ physician–patient relationship, arguing that the personal, patient-centered relationship confers diagnostic, therapeutic, and prognostic advantages that are empirically measurable 45.

The Central Role Of Internists And Internal Medicine In Modern Semiology

Internal medicine occupies a unique and structurally central position within contemporary healthcare systems, particularly in relation to clinical semiology and diagnostic reasoning (Table 3). Internists are, by training and clinical mandate, specialists of diagnostic uncertainty: they manage patients with undifferentiated, multisystem, and evolving clinical presentations in which no single organ-based framework is initially sufficient. This positions internal medicine as the primary discipline in which history taking and physical examination retain maximal epistemic value.
In contrast to organ-specific specialties, internists integrate

information across systems, temporal trajectories, and levels of diagnostic resolution, thereby functioning as "synthesis physicians" in complex care pathways. Their reasoning process inherently depends on semiological competence, as the initial clinical encounter often determines the entire diagnostic cascade, including the appropriate use and sequencing of imaging, laboratory testing, and specialist referral. In this sense, internists act as both gatekeepers and integrators of diagnostic information.

Moreover, internal medicine has historically been the intellectual home of clinical reasoning. From the classical teachings of Oslerian bedside medicine to modern evidence-based diagnostic frameworks, internists have played a leading role in formalizing the principles of hypothesis-driven examination, likelihood-based reasoning, and probabilistic diagnosis. This tradition places the specialty at the core of efforts to preserve and modernize semiology in the era of technological medicine.

Beyond clinical care, internists are also the principal educators responsible for transmitting semiological skills to successive generations of physicians. Their involvement in undergraduate and postgraduate training makes them key agents in reversing the documented decline in bedside teaching and in restoring structured, observation-based clinical apprenticeship. As such, the future quality of semiology is inseparable from the institutional strength of internal medicine as a discipline.

Finally, in the emerging ecosystem of artificial intelligence, point-of-care ultrasonography, and multimodal diagnostics, internists are uniquely positioned to serve as critical interpreters of integrated data. Their role is not merely to apply technology, but to contextualize and adjudicate its outputs against the lived reality of the patient. This reinforces their function as essential mediators between technological systems and clinical meaning, ensuring that diagnostic innovation remains anchored in bedside truth.

Table 3: Central Roles of Internists in the Preservation and Advancement of Clinical Semiology

Domain	Core Role of Internists	Impact on Clinical Semiology and Diagnostic Process
Diagnostic uncertainty	First-line management of undifferentiated and multisystem presentations	Maximizes reliance on history and physical examination to generate initial diagnostic hypotheses
Clinical integration	Synthesis of symptoms, signs, laboratory data, imaging, and AI outputs	Ensures coherence across heterogeneous diagnostic inputs and prevents fragmented reasoning
Bedside reasoning	Application of hypothesis-driven, likelihood-based examination strategies	Translates semiological findings into probabilistic diagnostic refinement
Gatekeeping function	Regulation of downstream use of imaging and specialist referral	Reduces unnecessary investigations and limits overdiagnosis and overuse
Cognitive leadership	Anchoring of System 1 (pattern recognition) and System 2 (analytical reasoning) processes	Improves diagnostic accuracy and mitigates cognitive bias through structured reasoning
Medical education	Training of students and residents in bedside skills and semiological methods	Critical for reversing decline in physical examination proficiency
Technological mediation	Interpretation of POCUS, laboratory data, and AI-generated differentials	Ensures appropriate contextualization of technological outputs within clinical reality
Continuity of care	Longitudinal follow-up of complex patients across care settings	Strengthens diagnostic calibration through temporal clinical observation

Future Directions

We envision a convergent model of 21st-century clinical medicine in which semiology serves as the structuring frame around which POCUS, AI-assisted decision support, and laboratory analytics are integrated. In this model, the clinical history generates the prior probability landscape; the physical examination begins probability revision; and POCUS, targeted laboratory tests, and AI-generated differential diagnoses are deployed selectively to achieve diagnostic closure (Figure 1 — not shown). This framework places the clinician in the role of integrative reasoner rather than passive consumer of algorithmic outputs.

Several research priorities follow from this vision. First, we need large-scale prospective studies quantifying the impact of structured semiological training on diagnostic error rates — outcome data that remain sparse. Second, structured national databases of clinical findings linked to final diagnoses would enable machine-learning models to be trained on richer, examination-derived features. Third, telemedicine examination protocols deserve rigorous, condition-specific validation studies with adequate power and gold-standard comparators. Finally, the role of POCUS within the diagnostic algorithm needs to be formalized by evidence-based guidelines that specify which clinical presentations warrant its addition to standard physical examination.

Conclusions

Clinical semiology is neither obsolete nor sufficient in isolation. History taking and physical examination generate the diagnoses, hypotheses, and pre-test probabilities without which no subsequent diagnostic technology — however sophisticated — can function optimally. Fifty years of replicated data confirm that approximately 76–82% of diagnoses in ambulatory medicine arise from the clinical history, with targeted physical examination contributing a further 8–12%. Key semiological signs achieve likelihood ratios that substantially alter diagnostic probability across all major organ systems.

The decline of bedside teaching, the rise of diagnostic over-investigation, and the partial eclipse of the clinical examination by technological intermediaries represent a quality and safety hazard. Diagnostic error rates remain alarmingly high — averaging 5.7% across all emergency department conditions, with rates exceeding 30–50% for individual presentations such as spinal epidural abscess — and deficiencies in history taking and physical examination are implicated in the majority of these errors.

In this context, internists occupy a pivotal and increasingly strategic position within the healthcare ecosystem. As physicians trained to manage diagnostic uncertainty, multimorbidity, and undifferentiated clinical presentations, they represent the principal custodians of clinical reasoning at the interface between organ-based specialties. Their practice is inherently hypothesis-driven and semiology-dependent, requiring continuous integration of narrative history, physical examination, longitudinal observation, and evolving technological data. Internists therefore function not only as diagnosticians, but also as integrators of complexity, ensuring coherence across fragmented diagnostic pathways. Beyond their clinical role, internists are the primary transmitters of semiological competence within medical education. They are uniquely positioned to reverse the documented erosion of bedside skills through structured teaching, supervision at the point of care, and reinforcement of hypothesis-driven, likelihood ratio–based clinical reasoning. In addition, internists serve as critical mediators between emerging technologies — including POCUS, advanced imaging, and artificial intelligence systems — and real-world clinical interpretation. By anchoring these tools in bedside findings, they prevent technological over-reliance and preserve diagnostic meaning.

In the era of POCUS and AI, semiology's role evolves but does not diminish: it provides the hypothesis that makes POCUS interpretable, the clinical context that makes AI output meaningful, and the human contact that sustains the therapeutic physician–patient relationship. Internists, as integrators of these domains, are essential to ensuring that technological progress strengthens rather than supplants clinical judgment.

Medical education must respond urgently to the erosion of bedside skills, reinvesting in structured, hypothesis-driven, likelihood ratio–informed bedside teaching as a core competency. The renaissance of semiology is not a nostalgic aspiration — it is an evidence-based clinical, educational, and organizational imperative, with internal medicine at its core.

Conflict Of Interest Statement

The authors declare no conflicts of interest relevant to this article. N. Lorenzo-Villalba serves on the Scientific Committee of La Revue de Médecine Interne (COPE declaration). E. Andrès serves as Chef Editor of Journal of Clinical Medicine (COPE declaration).

Funding

No specific funding was received for this review.

Author Contributions

E.A.: concept, literature review (using Pubmed, Google Scholar, ResearchGate), manuscript drafting, final approval. N.L.-V.: literature review, critical revision, co-authorship. All authors approved the final version of the manuscript. Generative artificial intelligence tools, including ChatGPT and Claude AI, were used during the preparation of this manuscript for language editing, stylistic improvement, text structuring, and literature synthesis assistance. All AI-assisted content was critically reviewed, revised, and validated by the authors, who take full responsibility for the accuracy, integrity, and originality of the final manuscript. AI tools were not used for data generation, data analysis, or independent scientific decision-making.

References

1. Ramani S, Leinster S. AMEE Guide no. 34: Teaching in the clinical environment. Med Teach. 2008;30(4):347–364. PMID: 18569655
2. Ramani S. Twelve tips to improve bedside teaching. Med Teach. 2003;25(2):112–115. PMID: 12745329
3. Turner PJ, Cabrillo JV, Sanjay P, Bain E. The value of the physical examination in clinical practice: an international survey. Clin Med (Lond). 2017;17(6):490–498. PMID: 29196348
4. McGee S. Evidence-Based Physical Diagnosis. 4th ed. Philadelphia, PA: Elsevier; 2018. ISBN: 9780323392761
5. Simel DL, Rennie D, eds. The Rational Clinical Examination: Evidence-Based Clinical Diagnosis. New York: McGraw-Hill; 2008.
6. Benseñor IM. Do you believe in the power of clinical examination? The answer must be yes! Sao Paulo Med J. 2003;121(1):3–4. PMID: 14989136
7. Hampton JR, Harrison MJ, Mitchell JR, Prichard JS, Seymour C. Relative contributions of history-taking, physical examination, and laboratory investigation to diagnosis and management of medical outpatients. Br Med J. 1975;2(5969):486–489. PMID: 1148666
8. Peterson MC, Holbrook JH, Von Hales D, Smith NL, Staker LV. Contributions of the history, physical examination, and laboratory investigation in making medical diagnoses. West J Med. 1992;156(2):163–165. PMID: 1536065
9. Roshan M, Rao AP. A study on relative contributions of the history, physical examination and investigations

in making medical diagnosis. J Assoc Physicians India. 2000;48(8):771–775. PMID: 11273467
10. Croskerry P. A universal model of diagnostic reasoning. Acad Med. 2009;84(8):1022–1028. PMID: 19707898
11. Croskerry P, Singhal G, Mamede S. Cognitive debiasing 1: origins of bias and theory of debiasing. BMJ Qual Saf. 2013;22(Suppl 2):ii58–ii64. PMID: 23882089
12. Elstein AS, Schwartz A. Clinical problem solving and diagnostic decision making: selective review of the cognitive literature. BMJ. 2002;324(7339):729–732. PMID: 11909793
13. McGee S. Simplifying likelihood ratios. J Gen Intern Med. 2002;17(8):647–650. PMID: 12213147
14. Simel DL, Rennie D. The Rational Clinical Examination: twenty-five years. JAMA. 2015;313(20):2049–2050. PMID: 26010637
15. Cook C, Hegedus E. Diagnostic utility of clinical tests for spinal dysfunction. Man Ther. 2011;16(1):21–25. PMID: 20851677
16. Verghese A, Brady E, Kapur CC, Horwitz RI. The bedside evaluation: ritual and reason. Ann Intern Med. 2011;155(8):550–553. PMID: 22007046
17. Faustinella F, Jacobs RJ. The decline of clinical skills: a challenge for medical schools. Int J Med Educ. 2018;9:195–197. PMID: 30122129; PMC6129153
18. Newman-Toker DE, et al. Diagnostic errors in the emergency department: a systematic review. Comparative Effectiveness Review No. 258. AHRQ 2022. Bookshelf NBK588123
19. Gandhi TK, Kachalia A, Thomas EJ, et al. Missed and delayed diagnoses in the ambulatory setting: a study of closed malpractice claims. Ann Intern Med. 2006;145(7):488–496. PMID: 17015866
20. Brownlee S, Chalkidou K, Doust J, et al. Evidence for overuse of medical services around the world. Lancet. 2017;390(10090):156–168. PMID: 28077234
21. Tierney LM Jr, Henderson MC. The Hypothesis-Driven Physical Examination. Med Clin North Am. 2018;102(3):433–442. PMID: 29650065
22. Katchamart W, Narongroeknawin P, Leelaporn A, Nimitvilai S. Accuracy of physical examination for detecting aortic stenosis: a systematic review and meta-analysis. J Gen Intern Med. 2022;37(9):2282–2290. PMID: 35820657
23. Tavel ME. Cardiac auscultation: a glorious past—and it does have a future! Circulation. 2006;113(9):1255–1259. PMID: 16520404
24. Olson AP, Trappey B, Wagner M, Newman M, Nixon LJ, Schnobrich D. Point-of-care ultrasonography improves the diagnosis of splenomegaly in hospitalized patients. Crit Ultrasound J. 2015;7(1):13. PMID: 26329539; PMC4574040
25. Juhl M, Pallesen LT, Rahr J, Damsgaard EM. Diagnostic accuracy of history taking, physical examination and imaging for phalangeal, metacarpal and carpal fractures: a systematic review update. Orthop Traumatol Surg Res. 2019;105(8):1745–1758. PMC6947988
26. Janssen AM, van Laar M, van Middelkoop M, et al. Diagnostic accuracy of history taking, physical examination and auxiliary examination for thumb osteoarthritis: a systematic review. Osteoarthritis Cartilage. 2024;32(4):389–400. PMC12551402
27. Pitcher M, Moulson A, Pitcher D, Herbland A, Cairns MC. Diagnostic accuracy of subjective features and physical examination tests for Morton neuroma: a systematic review. Foot Ankle Spec. 2024;18(3):276–284. PMC11574893
28. Kalter HD, Burnham G, Kolstad PR, et al. Evaluation of clinical signs to diagnose anaemia in Uganda and Bangladesh, in areas with and without malaria. Bull World Health Organ. 1997;75(Suppl 1):103–111. PMID: 9529718; accuracy data cited: PMC11020582
29. Lu AD, Srinivasan M, Tsai J, et al. Systematic review of physical examination components adapted for telemedicine. J Telemed Telecare. 2022;28(10):718–728. PMID: 35363573
30. López Palmero S, López Zúñiga MA, Rodríguez Martínez V, et al. Point-of-Care Ultrasound (POCUS) as an extension of the physical examination in patients with bacteremia or candidemia. J Clin Med. 2022;11(13):3636. PMC9267352
31. Conventional physical examination extended by bedside ultrasound: a new paradigm in nephrological practice. Port J Nephrol Hypert. 2021;35(3):158–162. PMC8428643
32. Argaiz ER, Koratala A, Reisinger N. Comprehensive assessment of fluid status by point-of-care ultrasonography. Kidney Med. 2021;3(5):802–816. PMID: 34693267
33. Ueda D, Kakinuma T, Tousen Y, et al. Systematic review and meta-analysis of diagnostic performance comparison between generative AI and physicians. npj Digit Med. 2025;8:153. PMC11929846
34. Rodman A, Buckley TA, Manrai AK, Morgan DJ. Artificial intelligence vs clinician performance in estimating probabilities of diagnoses before and after testing. JAMA Netw Open. 2023;6(12):e2347075. PMC10714249
35. Levine DM, Kaluzny Y, Bhatt AS, et al. The diagnostic and triage accuracy of the GPT-3 artificial intelligence model. Lancet Digit Health. 2024;6(8):e555–e561. PMID: 38997801
36. Croskerry P, Norman GR. Overconfidence in clinical decision making. Am J Med. 2008;121(5 Suppl):S24–S29. PMID: 18440351
37. Bhatt H, Dev H, Bhatt D, Bhatt N. Bedside teaching: an underutilized tool in medical education. Adv Med Educ Pract. 2016;7:437–445. PMC4983186
38. Ferreira-Valente MA, Pais-Ribeiro JL, Jerónimo M, Rodrigues P. An objective structured clinical exam to assess semiology skills of medical students. Acta Med Port. 2017;30(4):274–280. PMID: 28425885
39. Henderson MC, Tierney LM Jr, Smetana GW, eds. The Patient History: Evidence-Based Approach. 2nd ed. New York: McGraw-Hill; 2012. [Hypothesis-driven approach, PMID 29650065]
40. Choi JJ, Gribben J, Lin M, Abramson EL, Aizer J. Using an

experiential learning model to teach clinical reasoning theory and cognitive bias: an evaluation of a first-year medical student curriculum. Med Educ Online. 2022;27(1):2153782. PMC9718553
41. Verghese A. Culture shock—patient as icon, icon as patient. N Engl J Med. 2008;359(26):2748–2751. PMID: 19109577
42. Kravitz RL, Bell RA, Franks P, Azari R, Kelly-Reif S, Silvis C. The physical examination: a survey of patient preferences and expectations during primary care visits. Arch Intern Med. 2020 [ePub]; PMC7085258
43. Derse AR. The physician-patient relationship. N Engl J Med. 2022;387(8):669–672. PMID: 35984346
44. Tarn DM, Heritage J, Paterniti DA, Hays RD, Kravitz RL, Wenger NS. Physician communication when prescribing new medications. Arch Intern Med. 2006;166(17):1855–1862. PMID: 17000944
45. Keller F, Ludwig U, Huber-Lang M. Enemy or friend: the personal and the factual patient-physician relationship. Front Med. 2023;10:1098305. PMID: 37273908
46. Cook DJ, Simel DL. The rational clinical examination: does this patient have abnormal central venous pressure? JAMA. 1996;275(8):630–634. PMID: 8594245
47. Ebell MH, Siwek J, Weiss BD, et al. Simplifying the language of evidence to improve patient care: strength of recommendation taxonomy (SORT). J Fam Pract. 2004;53(2):111–120. PMID: 14764275
48. Sackett DL, Haynes RB. The architecture of diagnostic research. BMJ. 2002;324(7336):539–541. PMID: 11872558
49. Morgan DJ, Pineles L, Owczarzak J, et al. Accuracy of practitioner estimates of probability of diagnosis before and after testing. JAMA Intern Med. 2021;181(6):747–755. PMID: 33818595
50. Nagueh SF, Smiseth OA, Appleton CP, et al. Recommendations for the evaluation of left ventricular diastolic function by echocardiography. J Am Soc Echocardiogr. 2016;29(4):277–314. PMID: 27037982 [cited for comparative POCUS accuracy benchmark]