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E pluribus unum: The diagnostician

Will Artificial Intelligence prompt a merger of radiology and pathology into one specialty?

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ABSTRACT

Artificial Intelligence (AI) is a transformative force that is reshaping the very foundations of diagnostic medicine. As AI-driven technologies increasingly blur the boundaries between image interpretation and tissue analysis, the rationale for maintaining radiology and pathology as separate specialties becomes less compelling. A merger into a unified specialty - diagnostic medicine - could offer new opportunities for synergy, enabling clinicians to deliver more accurate, timely, and personalized care. This paper argues that the convergence of radiology and pathology is not only a likely development but also important for the future of precision medicine. The integration of imaging, histopathology, and molecular diagnostics will support a new generation of diagnosticians equipped to navigate complex data landscapes and guide clinical decision-making with deeper insight.

1. Introduction

Calls for a merger between radiology and pathology are gaining momentum, driven by the rapid evolution of AI and its capacity to unify image-centric disciplines [1]. While some critics argue that AI will simply augment existing workflows, we contend that it will fundamentally reshape them making the case for a unified specialty both logical and urgent. Prior reviews emphasize AI's potential in reshaping radiology workflows [2] and the computational advances supporting integrated diagnostics [3].

Radiologists and pathologists share a common mission: to interpret visual data and extract clinically actionable insights. Yet, they operate in silos, often duplicating efforts and missing opportunities for synergy. AI disrupts this paradigm by enabling seamless integration of radiological imaging, histopathological analysis, and molecular profiling. The result is a richer, more holistic understanding of disease, one that transcends traditional boundaries.

The concept of the "diagnostician" - a physician trained in both imaging and pathology - is no longer theoretical. It is a necessary evolution in response to the demands of precision oncology, adaptive radiotherapy, and personalized medicine. Academic institutions and multinational corporations are already pioneering integrated diagnostic workflows demonstrating the feasibility and clinical value of this approach.

This paper advocates for a deliberate and strategic merger of radiology and pathology into a unified specialty. We explore the technological, educational, and institutional reforms required to realize this vision, and we present case studies and stakeholder perspectives that underscore its urgency and potential.

Case. Studies in Integrated Diagnostics

Case Studies in Integrated Diagnostics Recent meta-analyses confirm AI-enhanced digital pathology improves diagnostic accuracy [4], while new frameworks demonstrate direct integration of radiology and pathology data [5].

2. UCLA integrated diagnostics initiative

UCLA has developed a pioneering integrated radiology-pathology workflow for cancer diagnosis, particularly in breast cancer [6]. Their model addresses the issue of discordant findings where radiology suggests malignancy, but pathology does not confirm it by creating

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structured, standardized workflows that ensure real-time communication between departments. This has led to improved diagnostic accuracy and reduced false negatives.

Additionally, UCLA's Integrated Diagnostics Shared Resource (IDX) maintains a longitudinal database linking radiology, pathology, molecular, and outcomes data [6]. It supports research and clinical decision-making across multiple cancer types (e.g., prostate, lung, kidney, breast, liver), enabling lesion-level annotation and genomic correlation.

3. Proscia's concentriq platform

Proscia, a leader in digital pathology, has developed Concentriq, an AI-powered platform that integrates pathology with molecular and clinical data [7]. Used by 16 of the top 20 pharmaceutical companies, it supports over 22,000 patient diagnoses daily. The platform enables biomarker discovery, clinical trial optimization, and personalized treatment planning all within a unified diagnostic ecosystem.

Proscia's success demonstrates how digital pathology, when integrated with imaging and AI, can become the backbone of precision medicine. Their partnerships with Siemens Healthineers and Agilent Technologies further validate the commercial and clinical viability of this approach.

4. National academies workshop on integrated diagnostics

A 2024 workshop hosted by the National Academies of Sciences explored the integration of radiology, pathology, and laboratory medicine in precision oncology [8]. Experts emphasized that combining diagnostic data streams supported by AI can guide treatment decisions more effectively and improve patient outcomes. The workshop highlighted lung cancer as a key example, where integrated diagnostics determine eligibility for targeted therapies.

5. Training reform for the diagnostician specialty

Unified Curriculum Design Updated curricula are necessary given emerging AI trends in pathology and medicine [9]. A new specialty would require a curriculum that blends core competencies from both radiology and pathology, along with molecular diagnostics and AI literacy. The following table summarizes the proposed components of training reform for the emerging Diagnostician specialty, integrating radiology, pathology, molecular diagnostics, and AI literacy.

Component	Description
Unified Curriculum Design	Combines core competencies from radiology, pathology, molecular diagnostics, and AI literacy.
Integrated Residency	5–6 year program with rotations in radiology, pathology, oncology, informatics; dual mentorship and interdisciplinary experience.
Fellowship Opportunities	Subspecialties in Oncologic Diagnostics, AI-Augmented Diagnostics, Molecular Imaging & Pathology, Digital Health & Informatics.
Certification & Accreditation	Joint pathways via ABR and ABP or a new Board of Diagnostic Medicine.
Continuing Medical Education (CME)	Covers AI ethics, bias mitigation, biomarkers, adaptive therapy, and integrated reporting standards.

6. Stakeholder perspectives on diagnostic integration

Stakeholder Perspectives on Diagnostic Integration Recent evidence shows that radiologists' interaction with AI varies depending on experience and case complexity, highlighting both opportunities and risks [10].

7. Clinicians and oncologists

Oncologists increasingly advocate for integrated diagnostics to improve treatment planning and response monitoring. They emphasize the value of correlating imaging and pathology data to guide precision therapies, especially in complex cancers. Tumor boards and multidisciplinary teams benefit from unified diagnostic reports, which reduce discordant findings and streamline decision-making.

8. Hospital administrators

Hospital leaders view integrated diagnostics as a strategic asset. A recent survey revealed that 83 % of hospital CEOs are concerned about lab technologist shortages, prompting interest in cross-trained diagnosticians [11]. Administrators see integrated lab strategies as key to improving operational efficiency, standardizing care, and reducing costs. They also highlight the importance of real-time access to diagnostic data for clinicians and patients.

9. Industry leaders

Executives from diagnostic companies believe that the future lies in non-invasive biomarker testing, AI-assisted diagnostics, and data interoperability [12]. Industry stakeholders are investing in platforms that combine radiology, pathology, and molecular data to support early detection and personalized medicine. They view the merger to potentially reduce clinician burnout, foster innovation, and enhance outcomes.

10. Institutional and educational stakeholders

A qualitative study from the University of Tübingen found that clinicians, students, and AI experts perceive AI integration to increase efficiency, reduce workload, and enhance patient safety [13]. However, concerns remain about over-reliance on technology, ethical implications, and the need for transparent decision-making. Stakeholders emphasized the importance of interdisciplinary collaboration and context-sensitive implementation strategies.

11. Challenges and strategic opportunities

The convergence of radiology and pathology into a unified specialty - diagnostic medicine - is an ambitious proposal, but not without its complexities. Rather than viewing these challenges as barriers, we propose they be seen as opportunities to improve healthcare delivery and professional practice.

12. Data integration and interpretation

The integration of radiological images, histopathological slides, and molecular profiles presents a formidable challenge. However, it also offers a unique opportunity to develop standardized, interoperable platforms that unify diagnostic data streams. AI-powered tools can harmonize diverse datasets, enabling clinicians to extract richer insights and deliver more precise, patient-centered care.

13. Interdisciplinary collaboration

Radiology and pathology have traditionally operated in silos, each with distinct workflows and expertise. Merging these disciplines requires a cultural shift toward interdisciplinary collaboration, mutual respect, and shared clinical goals. This transformation can foster a new generation of diagnosticians trained to integrate imaging and tissue analysis, enhancing diagnostic accuracy and clinical relevance.

14. Technological infrastructure

Building the infrastructure to support integrated diagnostics is a significant undertaking. Yet, it is also a chance to invest in next-generation technologies such as cloud-based platforms, AI engines, and real-time data exchange systems that will define the future of precision medicine. These investments will reduce diagnostic turnaround times and improve coordination across specialties.

15. Ethical and regulatory considerations

The convergence of diagnostic data raises important questions about privacy, consent, and data governance, especially in genomic profiling. Addressing these concerns proactively can position the merged specialty as a leader in ethical AI deployment, ensuring transparency, accountability, and patient trust.

16. Education and training reform

Redesigning medical education to support a unified specialty is both a challenge and a transformative opportunity. Integrated training programs can prepare diagnosticians to navigate complex data landscapes, correlate imaging with pathology, and contribute meaningfully to multidisciplinary care teams. This reform will not only modernize medical education but also attract a new generation of professionals eager to lead in a data-driven healthcare environment.

17. Discussion

We believe that radiologists and pathologists, though traditionally operating in parallel, must now evolve toward integration. The increasing complexity of diseases - particularly in oncology - calls for a unified diagnostic lens. AI enables this by correlating imaging features with histopathological and molecular data, offering clinicians a multidimensional view of disease processes. This convergence is already reshaping clinical workflows, with institutions and industry leaders adopting integrated diagnostic platforms that unify radiology, pathology, and genomics.

Consider a patient with suspected lung cancer undergoing diagnostic workup. Traditionally, radiologists interpret the CT scan, while pathologists analyze the biopsy, often in isolation. In an integrated diagnostic model, however, imaging findings (e.g., spiculated nodule morphology) are immediately correlated with histopathological features and molecular markers (e.g., EGFR mutation status), enabling a unified report that guides targeted therapy. This kind of collaborative workflow, supported by AI, exemplifies the potential of a diagnostician-led approach to streamline decision-making and improve outcomes.

In our view, AI is not a replacement for human expertise but a powerful augmentation. The future diagnostician will be a hybrid professional equipped to interpret imaging, analyze tissue, understand molecular signatures, and apply AI-driven insights to clinical care. Achieving this vision, however, demands systemic change, new training programs, redefined roles, and a reimagined healthcare infrastructure.

The merger of radiology and pathology into a unified specialty is not just a technological possibility, it is a clinical necessity. It promises to improve diagnostic precision, accelerate treatment planning, and support the development of personalized therapies. Yet, realizing this vision requires overcoming challenges in data integration, interdisciplinary collaboration, infrastructure development, and ethical governance.

Ultimately, we argue that the future of diagnostic medicine lies in embracing this convergence. By fostering innovation, reforming education, and aligning stakeholder interests, diagnosticians will be better positioned to deliver informed, efficient, and patient-centered care. This merger represents a transformation, one that healthcare systems should actively consider and prepare for.

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Author contributions

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Ethical Statement

This manuscript is a Perspective/Opinion piece and does not involve original research with human participants or animals. Therefore, ethical approval and informed consent were not required. The authors affirm that the content adheres to the ethical standards of academic publishing and that all sources and contributions have been appropriately acknowledged.

CRediT authorship contribution statement

Mathias Goyen: Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Evis Sala:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing.

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Data availability

No data was used for the research described in the article.

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