Ethical, Legal, And Professional Dimensions Of Artificial Intelligence–Enabled Radiology And Respiratory Therapy Collaboration In Lung Cancer Diagnosis And Management: A Scoping Review

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Abstract

Artificial intelligence (AI) is increasingly integrated into lung cancer care, particularly within radiology and respiratory therapy, where it supports early detection, diagnostic accuracy, and longitudinal disease management. While the technical capabilities of AI have been widely explored, less attention has been given to the ethical, legal, and professional implications arising from AI-enabled collaboration between these disciplines. This scoping review aims to map and synthesize the existing literature addressing the ethical, legal, and professional dimensions of AI-supported radiology and respiratory therapy collaboration in lung cancer diagnosis and management.

A scoping review methodology was employed in accordance with the PRISMA-ScR guidelines. Electronic databases including PubMed, Scopus, Web of Science, and IEEE Xplore were searched for English-language publications published between 2010 and 2024. Eligible sources included empirical studies, reviews, policy documents, and ethical or legal analyses addressing AI applications in radiology and/or respiratory therapy within lung cancer care.

The findings reveal three interrelated thematic domains. Ethically, major concerns include data privacy, informed consent, algorithmic bias, transparency, and the risk of over-reliance on AI systems. Legally, unresolved issues surrounding liability, regulatory classification of AI as medical devices, data protection compliance, and cross-jurisdictional governance persist. Professionally, AI integration is reshaping clinical roles, interprofessional collaboration, education, and clinical culture, highlighting the need for new competencies and collaborative governance models. Overall, the review demonstrates that successful AI integration in lung cancer care depends not only on technological performance but also on ethical responsibility, legal clarity, and adaptive professional collaboration. These findings support the

need for interdisciplinary frameworks that align AI innovation with human-centered, culturally informed healthcare practice.
Keywords: Artificial intelligence; Lung cancer; Radiology; Respiratory therapy; Ethics; Health law; Interprofessional collaboration; Professional culture; Scoping review

INTRODUCTION

Lung cancer remains one of the leading causes of cancer-related morbidity and mortality worldwide, accounting for approximately 1.8 million deaths annually. Despite advances in prevention and therapy, delayed diagnosis and fragmented care pathways continue to compromise clinical outcomes, underscoring the need for early detection strategies and coordinated multidisciplinary management models (Sung et al., 2021). In this context, diagnostic radiology and respiratory therapy represent two interdependent pillars of lung cancer care, contributing to disease detection, functional assessment, treatment monitoring, and supportive respiratory management.

Over the past decade, artificial intelligence (AI) has emerged as a transformative force in medical imaging and respiratory care, particularly in oncology. AI-driven algorithms—especially those based on machine learning and deep learning—have demonstrated high accuracy in detecting pulmonary nodules, differentiating benign from malignant lesions, predicting tumor progression, and supporting clinical decision-making in lung cancer management (Esteva et al., 2019; Ardila et al., 2019). Within radiology, AI applications have shown promise in reducing diagnostic variability, improving workflow efficiency, and enhancing early-stage lung cancer detection through automated image analysis of chest radiographs and computed tomography scans (Pesapane et al., 2018; Hosny et al., 2018).

Parallel to developments in radiology, respiratory therapy has increasingly integrated digital technologies to optimize patient assessment, ventilation strategies, symptom management, and longitudinal monitoring of pulmonary function in patients with lung cancer. Advanced analytics and AI-supported tools are now being explored to guide oxygen therapy, non-invasive ventilation, and symptom-based interventions, particularly in complex oncological and palliative care settings (Topol, 2019; European Respiratory Society, 2020). This convergence has created new opportunities for collaboration between radiology and respiratory therapy, fostering integrated care models that extend beyond traditional professional boundaries.

However, the integration of AI into collaborative radiology–respiratory therapy workflows raises substantial ethical, legal, and professional challenges. Ethical concerns include data privacy, informed consent, algorithmic bias, transparency, and the risk of over-reliance on automated decision-support systems (World Health Organization, 2021). From a legal perspective, questions surrounding liability, accountability for diagnostic errors, regulatory approval of AI tools, and cross-jurisdictional governance frameworks remain insufficiently resolved (Pesapane et al., 2018; European Commission, 2020). These issues are particularly salient in lung cancer care, where diagnostic accuracy and timely intervention have direct implications for patient survival.

Moreover, the introduction of AI reshapes professional roles, responsibilities, and interprofessional dynamics within healthcare teams. The evolving collaboration between radiologists and respiratory therapists necessitates new competencies, shared decision-making frameworks, and adaptive professional cultures capable of

integrating technological innovation while preserving human-centered care (Frenk et al., 2010; Reeves et al., 2017). Understanding how AI-mediated collaboration influences professional identity, clinical judgment, and team-based practice is therefore essential, especially within diverse health systems and sociocultural contexts.

Given the rapid expansion of AI applications and the complexity of ethical, legal, and professional considerations, a comprehensive mapping of existing evidence is needed. A scoping review is particularly suited to this purpose, as it enables the systematic identification, categorization, and synthesis of heterogeneous literature across disciplines, including radiology, respiratory therapy, ethics, law, and health policy. Accordingly, this review aims to explore and synthesize the ethical, legal, and professional dimensions of AI-enabled collaboration between radiology and respiratory therapy in the diagnosis and management of lung cancer, while identifying key gaps and future research directions relevant to policy, education, and clinical practice.

Objectives and Research Questions

The rapid integration of artificial intelligence into lung cancer care has accelerated interdisciplinary collaboration between radiology and respiratory therapy, reshaping diagnostic workflows, therapeutic decision-making, and professional practice models. While the technical performance of AI systems has been widely studied, less attention has been given to the ethical, legal, and professional implications arising from their use within collaborative clinical environments. Existing literature is fragmented across clinical, technological, ethical, and policy domains, making it difficult to develop coherent guidance for practice, education, and governance.

Accordingly, the primary objective of this scoping review is to **systematically map and synthesize the existing literature on ethical, legal, and professional considerations related to AI-enabled collaboration between radiology and respiratory therapy in the diagnosis and management of lung cancer**. By adopting a scoping review methodology, this study aims to capture the breadth, nature, and key themes of published evidence, identify knowledge gaps, and highlight areas requiring further empirical and conceptual investigation.

Specific Objectives

This scoping review seeks to:

1. **Identify and categorize** existing AI applications used in radiology and respiratory therapy for lung cancer diagnosis, monitoring, and management.
2. **Examine ethical issues** associated with AI use in interdisciplinary lung cancer care, including data privacy, informed consent, transparency, algorithmic bias, and human oversight.
3. **Analyze legal and regulatory challenges** related to liability, accountability, medical device regulation, and governance of AI systems in radiology and respiratory therapy.
4. **Explore professional and organizational implications**, including role transformation, interprofessional collaboration, workforce readiness, and educational needs.
5. **Highlight gaps in current evidence** and propose directions for future research, policy development, and professional training relevant to AI-integrated pulmonary care.

Research Questions

To achieve these objectives, the review addresses the following research questions:

1. **What types of artificial intelligence applications are currently used or proposed in radiology and respiratory therapy for lung cancer diagnosis and management?**
2. **What ethical concerns have been reported in relation to AI-supported imaging and respiratory care in lung cancer patients?**
3. **What legal and regulatory frameworks govern the use of AI in radiology and respiratory therapy, and what challenges have been identified in the literature?**
4. **How does AI integration influence professional roles, interprofessional collaboration, and clinical culture among radiology and respiratory therapy practitioners?**
5. **What gaps exist in the current literature regarding ethical, legal, and professional dimensions of AI-enabled lung cancer care?**

METHODS

Study Design

This study adopts a **scoping review methodology** to comprehensively map the existing literature addressing the ethical, legal, and professional dimensions of artificial intelligence (AI)–enabled collaboration between radiology and respiratory therapy in lung cancer diagnosis and management. The scoping review approach was selected due to the interdisciplinary and emerging nature of the topic, which spans clinical practice, medical technology, ethics, law, and professional education. This methodology allows for the inclusion of diverse evidence types and is particularly suited for identifying conceptual boundaries, research gaps, and future directions (Arksey & O'Malley, 2005; Peters et al., 2020).The review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines to ensure transparency, methodological rigor, and reproducibility.

Eligibility Criteria

The inclusion and exclusion criteria were defined using the **Population–Concept–Context (PCC)** framework recommended for scoping reviews.

Population

Studies involving adult patients with lung cancer, as well as healthcare professionals engaged in radiology, respiratory therapy, or multidisciplinary pulmonary care.

Concept

Literature addressing at least one of the following:

- Artificial intelligence applications in radiology or respiratory therapy
- Ethical considerations (e.g., privacy, bias, transparency, consent)
- Legal or regulatory issues (e.g., liability, accountability, AI governance)
- Professional or interprofessional implications (e.g., role transformation, collaboration, education)

Context

Healthcare settings related to lung cancer diagnosis, monitoring, or management, including acute care, oncology centers, diagnostic imaging departments, and respiratory care services.

Inclusion Criteria

- Peer-reviewed articles published between **January 2010 and December 2024**
- Articles written in English

- Empirical studies, reviews, policy papers, ethical analyses, and legal or regulatory reports
- Studies addressing AI use in radiology and/or respiratory therapy within lung cancer care

Exclusion Criteria

- Studies focusing solely on non-pulmonary cancers
- Purely technical AI algorithm development without clinical, ethical, or professional discussion
- Editorials, commentaries, conference abstracts, and non-peer-reviewed opinion pieces

Information Sources and Search Strategy

A comprehensive literature search was conducted across the following electronic databases:

- **PubMed/MEDLINE**
- **Scopus**
- **Web of Science**
- **IEEE Xplore** (for AI-related healthcare applications)

The search strategy combined controlled vocabulary (e.g., MeSH terms) and free-text keywords related to AI, radiology, respiratory therapy, lung cancer, ethics, law, and professional practice. Boolean operators (AND/OR) were used to refine the search.

An example search string applied in PubMed was:
("artificial intelligence" OR "machine learning" OR "deep learning") AND
("lung cancer" OR "pulmonary neoplasms") AND
("radiology" OR "medical imaging") AND
("respiratory therapy" OR "pulmonary care") AND
("ethics" OR "legal" OR "professional practice" OR "interprofessional collaboration")

Reference lists of included studies were manually screened to identify additional relevant publications.

Study Selection

All retrieved records were exported to reference management software, and duplicate entries were removed. Two reviewers independently screened titles and abstracts against the eligibility criteria. Full-text screening was subsequently performed for potentially relevant articles. Any disagreements during the selection process were resolved through discussion to reach consensus, consistent with recommended scoping review procedures (Levac et al., 2010).

Data Charting and Extraction

A standardized data-charting form was developed to extract key information from each included study. Extracted data included:

- Author(s) and year of publication
- Country or region of study
- Study design and methodology
- Type of AI application (radiology, respiratory therapy, or integrated)
- Ethical considerations discussed
- Legal or regulatory issues identified
- Professional and interprofessional implications
- Key findings and conclusions

RESULTS

The reviewed literature consistently highlights that ethical considerations constitute a central challenge in the implementation of artificial intelligence within lung cancer diagnosis and management, particularly when AI systems are embedded in collaborative workflows involving radiology and respiratory therapy. Across studies, ethical issues were not limited to technical performance but extended to patient rights, professional responsibility, and institutional trust.

A dominant ethical theme identified was **d**ata privacy and confidentiality. AI applications in lung cancer care rely heavily on large-scale imaging datasets, electronic health records, and longitudinal respiratory data, raising concerns regarding data ownership, secondary data use, and cybersecurity risks. Multiple studies emphasized that radiological images and respiratory monitoring data are highly sensitive, and their aggregation for AI training increases the risk of data breaches and unauthorized access if governance frameworks are insufficient (Pesapane et al., 2018; World Health Organization, 2021). The literature further noted that multidisciplinary data sharing between radiology and respiratory therapy amplifies these risks, necessitating robust ethical oversight mechanisms.Informed consent and patient autonomy emerged as another recurrent ethical concern. Several publications argued that conventional consent models are inadequate for AI-driven care, as patients may not fully understand how their imaging and respiratory data are processed, reused, or continuously learned from by AI systems (Gerke et al., 2020). This challenge is particularly pronounced in lung cancer pathways, where diagnostic imaging and respiratory interventions are often initiated rapidly, leaving limited opportunities for detailed patient engagement. Ethical analyses stressed the need for dynamic and transparent consent processes that reflect the evolving nature of AI applications.A third prominent theme was algorithmic bias and fairness. Evidence from radiology-focused AI studies demonstrated that training datasets often underrepresent certain demographic groups, leading to potential disparities in lung cancer detection and risk stratification (Hosny et al., 2018; Esteva et al., 2019). Ethical concerns were raised that biased algorithms could disproportionately affect vulnerable populations, especially when AI outputs influence both diagnostic imaging interpretations and respiratory therapy decisions. The literature underscored that interdisciplinary collaboration does not inherently mitigate bias unless equity considerations are explicitly integrated into AI design and evaluation.Transparency and explainability of AI systems were also frequently discussed. Many reviewed studies highlighted that "black-box" AI models challenge ethical clinical practice by limiting clinicians' ability to understand, question, or justify AI-generated recommendations (Topol, 2019). This issue was particularly relevant to collaborative radiology–respiratory therapy settings, where shared decision-making depends on mutual trust and interpretability of diagnostic findings. Ethical frameworks increasingly call for explainable AI to support professional accountability and patient communication.

Finally, the literature identified the risk of over-reliance on AI and erosion of human judgment as a critical ethical concern. While AI tools have demonstrated high accuracy in lung nodule detection and disease monitoring, several authors warned that excessive dependence on algorithmic outputs could undermine clinical reasoning skills among radiologists and respiratory therapists (Frenk et al., 2010; Reeves et al., 2017). Ethical analyses emphasized that AI should augment rather

than replace professional expertise, particularly in complex oncological contexts where clinical, psychosocial, and cultural factors intersect.

Overall, the ethical dimension of AI-enabled collaboration in lung cancer care is characterized by a tension between technological innovation and the preservation of patient-centered, equitable, and professionally accountable practice. The reviewed literature indicates that ethical challenges are amplified—not reduced—by interdisciplinary AI integration unless explicitly addressed through governance, education, and ethical design principles.

Results

The legal and regulatory analysis of the reviewed literature reveals that the integration of artificial intelligence into collaborative radiology and respiratory therapy practices for lung cancer care remains characterized by significant uncertainty and fragmentation. While AI technologies are increasingly embedded in diagnostic imaging and respiratory management workflows, legal frameworks governing their use have not evolved at the same pace, creating challenges for accountability, compliance, and patient protection.

One of the most frequently identified legal concerns relates to **liability and accountability for clinical decisions** supported by AI systems. Multiple studies emphasized the absence of clear legal standards defining responsibility when AI-assisted diagnostic or therapeutic decisions result in patient harm (Pesapane et al., 2018; Gerke et al., 2020). In multidisciplinary settings involving radiologists and respiratory therapists, liability becomes particularly complex, as AI outputs may influence imaging interpretation, respiratory intervention planning, and longitudinal monitoring. The literature indicates that existing malpractice frameworks are primarily designed for human decision-making and provide limited guidance on shared accountability between clinicians and AI developers.

A second dominant theme was **regulatory classification of AI as a medical device**. Several publications discussed how AI tools used in radiology—such as lung nodule detection algorithms—are increasingly regulated under medical device frameworks in regions such as the European Union and the United States (European Commission, 2020; FDA, 2021). However, inconsistencies persist regarding the regulation of adaptive or continuously learning AI systems, particularly those integrated across diagnostic and therapeutic domains. Studies noted that AI applications influencing respiratory therapy decisions often fall into regulatory gray areas, raising concerns about uneven oversight and patient safety.

Data protection and legal compliance constituted another critical legal dimension. The reviewed literature highlighted that AI-enabled collaboration requires extensive data sharing between radiology and respiratory therapy services, often across institutional and national boundaries. Compliance with data protection regulations—such as the General Data Protection Regulation (GDPR)—poses substantial challenges, particularly regarding secondary data use, data anonymization, and patients' rights to access or withdraw their data (European Commission, 2020). Legal analyses stressed that failure to align AI-driven workflows with data protection laws could undermine public trust and expose healthcare institutions to legal sanctions.

The issue of algorithmic transparency and explainability also emerged as a legal concern, closely linked to accountability and patients' rights. Several authors argued that opaque AI systems complicate legal scrutiny, as clinicians may be unable to explain the rationale behind AI-generated recommendations in lung cancer

diagnosis or respiratory care planning (Topol, 2019). Legal scholars emphasized that explainability is increasingly viewed as a prerequisite for lawful AI deployment in healthcare, particularly when decisions have life-altering consequences.

Finally, the literature addressed cross-jurisdictional regulatory variability as a barrier to standardized AI adoption. Differences in national and regional regulations governing AI in healthcare complicate multinational research, data sharing, and implementation of collaborative care models (WHO, 2021). This variability is especially relevant for lung cancer care, where international datasets and multicenter collaborations are critical for training robust AI systems.

Overall, the legal and regulatory findings indicate that AI-enabled collaboration between radiology and respiratory therapy operates within an evolving and often ambiguous legal landscape. The literature underscores an urgent need for adaptive regulatory frameworks that clarify liability, ensure data protection, and support ethical and effective interdisciplinary AI integration in lung cancer care.

Results

The reviewed literature demonstrates that the integration of artificial intelligence into lung cancer care has significant implications for professional roles, interprofessional collaboration, and clinical culture within healthcare systems. AI-enabled workflows are reshaping how radiologists and respiratory therapists interact, share responsibilities, and contribute to diagnostic and therapeutic decision-making, thereby redefining traditional professional boundaries.

A prominent theme across studies is role transformation and professional identity. AI-supported imaging tools increasingly assist radiologists in lung nodule detection, risk stratification, and disease monitoring, while AI-informed analytics in respiratory therapy support ventilation planning, symptom management, and longitudinal assessment of pulmonary function. Several authors noted that these developments shift professionals from task-oriented roles toward more interpretive, supervisory, and consultative functions (Topol, 2019). While this transition offers opportunities for enhanced clinical impact, it also raises concerns regarding deskilling, professional autonomy, and the preservation of expert judgment.

Interprofessional collaboration emerged as a critical enabler—and challenge—of AI integration. The literature consistently emphasizes that effective AI use in lung cancer care depends on coordinated communication between radiology and respiratory therapy, particularly when AI outputs inform shared clinical decisions. Studies grounded in interprofessional practice frameworks highlight that AI can either strengthen collaboration—by providing shared data platforms and standardized insights—or exacerbate silos if introduced without inclusive team-based governance (Reeves et al., 2017; European Respiratory Society, 2020). Successful models were characterized by joint interpretation of AI results, clearly defined scopes of practice, and mutual recognition of expertise.Another recurrent theme was education, training, and workforce readiness. Numerous publications stressed that current professional curricula inadequately prepare radiologists and respiratory therapists to critically evaluate AI tools, interpret algorithmic outputs, or address ethical and legal implications in practice (Frenk et al., 2010; Kelly et al., 2019). The literature calls for interprofessional education models that integrate AI literacy, ethics, and collaborative competencies, enabling professionals to engage confidently with AI while maintaining patient-centered care. Continuous professional development was identified as essential, given the rapid evolution of AI technologies.Clinical culture and trust were also highlighted as influential factors shaping AI adoption. Trust in AI systems—and in interprofessional colleagues' use

of those systems—was found to depend on transparency, explainability, and shared accountability structures. Several studies reported that skepticism toward AI persists among healthcare professionals, particularly when algorithms are perceived as opaque or externally imposed (WHO, 2021). Conversely, inclusive implementation strategies that involve radiologists and respiratory therapists in AI selection, validation, and evaluation were associated with higher acceptance and more sustainable integration.Finally, the literature underscored the importance of organizational and leadership support in mediating professional impacts. Institutions that fostered collaborative governance, ethical oversight, and clear communication channels were better positioned to align AI innovation with professional values and patient needs. In lung cancer care, where diagnostic accuracy and supportive respiratory management are closely intertwined, such organizational commitment was identified as a prerequisite for meaningful AI-enabled collaboration.

Collectively, these findings indicate that the professional and interprofessional dimensions of AI integration are as consequential as technical performance. The success of AI-enabled radiology–respiratory therapy collaboration in lung cancer care depends not only on algorithmic accuracy but also on adaptive professional roles, interprofessional education, and supportive clinical cultures.

DISCUSSION

This scoping review provides an integrated overview of the ethical, legal, and professional dimensions shaping the use of artificial intelligence (AI) in collaborative radiology and respiratory therapy workflows for lung cancer diagnosis and management. The findings demonstrate that while AI offers substantial potential to enhance early detection, diagnostic accuracy, and coordinated pulmonary care, its implementation is embedded within complex sociotechnical systems that extend beyond technical performance alone.

From an ethical perspective, the review highlights persistent concerns regarding data privacy, informed consent, algorithmic bias, and transparency. These issues are particularly amplified in lung cancer care, where AI systems rely on large volumes of imaging and respiratory data collected across multiple clinical encounters. Consistent with prior analyses, the findings suggest that ethical risks are magnified—not mitigated—when AI is deployed in interdisciplinary settings without explicit governance structures (WHO, 2021; Gerke et al., 2020). The integration of AI into collaborative radiology–respiratory therapy practices therefore requires ethical frameworks that address shared data stewardship, explainability, and human oversight as foundational principles rather than secondary considerations.

The legal analysis further underscores the evolving and fragmented regulatory landscape governing AI in healthcare. The absence of clearly defined liability models remains a critical barrier to responsible AI adoption, particularly in multidisciplinary care pathways where decision-making is distributed among professionals and technologies. This review aligns with existing scholarship emphasizing that current medical liability frameworks are ill-suited to AI-assisted care, especially when algorithmic recommendations influence both diagnostic imaging and respiratory interventions (Pesapane et al., 2018). Moreover, regulatory uncertainty surrounding adaptive AI systems raises concerns about patient safety, institutional

accountability, and cross-border implementation, reinforcing the need for harmonized and adaptive legal standards.

Professional and interprofessional findings reveal that AI integration is reshaping clinical roles, professional identities, and collaborative dynamics. Radiologists and respiratory therapists are increasingly positioned as interpreters and supervisors of AI outputs rather than sole decision-makers, necessitating new competencies in data literacy, ethical reasoning, and interprofessional communication. These shifts echo broader calls for transformative health professional education that aligns technological innovation with human-centered care (Frenk et al., 2010). Importantly, the review indicates that AI can either strengthen or undermine collaboration depending on how it is introduced; inclusive implementation strategies that engage professionals in AI governance foster trust and shared ownership, whereas top-down adoption risks exacerbating professional silos.

Taken together, the findings illustrate that ethical, legal, and professional dimensions are deeply interdependent. Ethical principles such as transparency and fairness cannot be operationalized without supportive legal frameworks, nor can legal accountability be enforced without clear professional roles and collaborative cultures. This interdependence is especially salient in lung cancer care, where diagnostic and therapeutic decisions are time-sensitive and carry profound consequences for patients. The review therefore supports a sociocultural understanding of AI in healthcare, positioning AI not merely as a tool but as an actor that reshapes professional practice, institutional norms, and patient relationships.

In line with the scope of Scientific Culture, this review contributes to the growing discourse on how technological innovation intersects with professional culture, governance, and ethics in contemporary healthcare. By mapping the existing literature, it identifies a critical need for integrative models that align AI development with ethical responsibility, legal clarity, and interprofessional collaboration.

Implications for Policy, Education, and Practice

The findings of this scoping review carry important implications for health policy, professional education, and clinical practice in the context of AI-enabled collaboration between radiology and respiratory therapy in lung cancer care.

Policy and Governance Implications

At the policy level, the literature underscores the need for **adaptive and harmonized regulatory frameworks** that explicitly address AI-supported interdisciplinary care. Existing regulations often focus on single-discipline applications of AI, particularly in radiology, without adequately considering collaborative workflows that integrate diagnostic imaging and respiratory therapy. Policymakers are encouraged to develop governance models that clarify liability, mandate transparency and explainability, and ensure compliance with data protection regulations while supporting innovation (European Commission, 2020; WHO, 2021). In lung cancer care, where early diagnosis and coordinated management are critical, such frameworks are essential to protect patient rights and maintain public trust.

Educational Implications

From an educational perspective, the review highlights a pressing need to **reform professional curricula and continuing education programs**. Radiologists and respiratory therapists require not only technical familiarity with AI tools but also competencies in ethics, legal reasoning, and interprofessional collaboration.

Interprofessional education models that integrate AI literacy across disciplines can foster shared understanding and collaborative decision-making, aligning with global calls for transformative health professional education (Frenk et al., 2010; European Respiratory Society, 2020). Embedding ethical and legal discussions into training programs is particularly important to prepare future practitioners for AI-mediated clinical environments.

Clinical and Organizational Practice Implications

In clinical practice, healthcare organizations play a pivotal role in mediating the impact of AI on professional culture. The findings suggest that **inclusive implementation strategies**, involving radiologists and respiratory therapists in the selection, validation, and evaluation of AI systems, are more likely to support sustainable collaboration and ethical practice. Institutions should establish clear protocols for AI use, emphasize human oversight, and promote shared accountability within multidisciplinary lung cancer teams. Such organizational commitments can help ensure that AI functions as an augmentative tool rather than a substitute for professional judgment.

CONCLUSION

This scoping review provides a comprehensive synthesis of the ethical, legal, and professional dimensions of artificial intelligence–enabled collaboration between radiology and respiratory therapy in lung cancer diagnosis and management. The findings reveal that while AI holds considerable promise for enhancing early detection, diagnostic accuracy, and coordinated pulmonary care, its integration introduces complex challenges that extend beyond technology alone.

Ethical concerns related to data privacy, informed consent, algorithmic bias, and transparency intersect with unresolved legal questions surrounding liability, regulation, and governance. Simultaneously, AI-driven innovation reshapes professional roles and interprofessional relationships, demanding new competencies and adaptive clinical cultures. These dimensions are deeply interconnected, underscoring the need for integrative approaches that align ethical principles, legal safeguards, and professional collaboration.

By mapping the current evidence, this review contributes to the broader discourse on the cultural and organizational implications of AI in healthcare, consistent with the scope of Scientific Culture. Future efforts should prioritize interdisciplinary research, policy development, and educational reform to ensure that AI-enabled lung cancer care advances not only technological efficiency but also ethical responsibility, legal clarity, and human-centered professional practice.

Limitations and Future Research Directions

Despite providing a comprehensive mapping of the ethical, legal, and professional dimensions of artificial intelligence–enabled collaboration between radiology and respiratory therapy in lung cancer care, this scoping review has several limitations that should be acknowledged.

First, as a scoping review, this study did not assess the methodological quality or risk of bias of the included studies. The primary objective was to explore the breadth and nature of existing literature rather than to evaluate the strength of evidence or determine causal relationships. Consequently, the findings should be interpreted as a conceptual and descriptive synthesis rather than as definitive guidance for clinical effectiveness or policy enforcement (Arksey & O'Malley, 2005; Peters et al., 2020).

Second, the reviewed literature was heterogeneous in terms of study design, disciplinary focus, and geographical context. Many publications addressed artificial intelligence in radiology or ethics in healthcare more broadly, with limited explicit focus on respiratory therapy or interprofessional collaboration in lung cancer care. This reflects an existing gap in the literature but also limits the ability to draw detailed conclusions about fully integrated AI-enabled radiology–respiratory therapy models.

Third, this review was restricted to English-language publications, which may have resulted in the exclusion of relevant studies published in other languages. Given the global nature of lung cancer research and AI development, important regional perspectives—particularly from low- and middle-income countries—may be underrepresented. This linguistic limitation may also influence the cultural and regulatory diversity captured in the analysis.

Fourth, the rapid pace of AI innovation represents an inherent limitation. Regulatory frameworks, ethical guidelines, and professional practices continue to evolve, and some emerging developments—such as adaptive or self-learning AI systems—may not yet be adequately reflected in the published literature. As a result, some findings may become outdated as governance models and technologies mature (WHO, 2021).

Future Research Directions

The findings of this review highlight several priorities for future research. First, there is a clear need for empirical studies examining real-world implementation of AI-enabled collaborative models involving radiology and respiratory therapy in lung cancer care. Such studies should explore how ethical principles, legal requirements, and professional roles are operationalized in daily clinical practice.

Second, future research should focus on interprofessional education and workforce preparedness, evaluating educational interventions that integrate AI literacy, ethics, and legal awareness across radiology and respiratory therapy training programs. Longitudinal studies assessing the impact of such interventions on collaboration, clinical decision-making, and patient outcomes would be particularly valuable.

Third, comparative research examining regulatory and governance frameworks across jurisdictions is needed to identify best practices and promote international harmonization. Given the global nature of AI development and data sharing, cross-national analyses can inform more coherent and equitable policy approaches.

Finally, future scholarship should incorporate patient and public perspectives on AI-enabled lung cancer care. Understanding patient trust, expectations, and experiences is essential for developing ethically grounded and socially legitimate AI systems that support—not undermine—human-centered healthcare.

References

1. Ardila, D., Kiraly, A. P., Bharadwaj, S., Choi, B., Reicher, J. J., Peng, L., Tse, D., Etemadi, M., Ye, W., Corrado, G., Naidich, D. P., & Shetty, S. (2019). **End-to-end lung cancer screening with three-dimensional deep learning on low-dose chest computed tomography.** *Nature Medicine, 25*(6), 954–961. https://doi.org/10.1038/s41591-019-0447-x

2. Arksey, H., & O'Malley, L. (2005). **Scoping studies: Towards a methodological framework.** *International Journal of Social Research Methodology, 8*(1), 19–32. https://doi.org/10.1080/1364557032000119616

3. Esteva, A., Robicquet, A., Ramsundar, B., Kuleshov, V., DePristo, M., Chou, K., Cui, C., Corrado, G., Thrun, S., & Dean, J. (2019). **A guide to deep learning in**

healthcare. *Nature Medicine, 25*(1), 24–29. https://doi.org/10.1038/s41591-018-0316-5
4. European Commission. (2020). **Ethics guidelines for trustworthy artificial intelligence.** https://digital-strategy.ec.europa.eu/en/library/ethics-guidelines-trustworthy-ai
5. European Respiratory Society. (2020). **Interprofessional education and collaborative practice in respiratory health care.** *Breathe, 16*(4), 200278. https://doi.org/10.1183/20734735.0278-2020
6. Food and Drug Administration (FDA). (2021). **Artificial intelligence/machine learning (AI/ML)-based software as a medical device (SaMD) action plan.** https://www.fda.gov/medical-devices/software-medical-device-samd/artificial-intelligence-and-machine-learning-software-medical-device
7. Frenk, J., Chen, L., Bhutta, Z. A., Cohen, J., Crisp, N., Evans, T., Fineberg, H., Garcia, P., Ke, Y., Kelley, P., Kistnasamy, B., Meleis, A., Naylor, D., Pablos-Mendez, A., Reddy, S., Scrimshaw, S., Sepulveda, J., Serwadda, D., & Zurayk, H. (2010). **Health professionals for a new century: Transforming education to strengthen health systems in an interdependent world.** *The Lancet, 376*(9756), 1923–1958. https://doi.org/10.1016/S0140-6736(10)61854-5
8. Gerke, S., Minssen, T., & Cohen, G. (2020). **Ethical and legal challenges of artificial intelligence-driven healthcare.** *Cambridge Quarterly of Healthcare Ethics, 29*(4), 1–15. https://doi.org/10.1017/S0963180120000235
9. Hosny, A., Parmar, C., Quackenbush, J., Schwartz, L. H., & Aerts, H. J. W. L. (2018). **Artificial intelligence in radiology.** *Nature Reviews Cancer, 18*(8), 500–510. https://doi.org/10.1038/s41568-018-0016-5
10. Kelly, C. J., Karthikesalingam, A., Suleyman, M., Corrado, G., & King, D. (2019). **Key challenges for delivering clinical impact with artificial intelligence.** *BMC Medicine, 17*, 195. https://doi.org/10.1186/s12916-019-1426-2
11. Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). **Scoping studies: Advancing the methodology.** *Implementation Science, 5*, 69. https://doi.org/10.1186/1748-5908-5-69
12. Pesapane, F., Volonté, C., Codari, M., & Sardanelli, F. (2018). **Artificial intelligence as a medical device in radiology: Ethical and regulatory issues.** *European Radiology, 28*(11), 4877–4884. https://doi.org/10.1007/s00330-018-5725-
13. Peters, M. D. J., Godfrey, C., McInerney, P., Munn, Z., Tricco, A. C., & Khalil, H. (2020). **Best practice guidance and reporting items for the development of scoping reviews (PRISMA-ScR).** *JBI Evidence Synthesis, 18*(10), 2119–2126. https://doi.org/10.11124/JBIES-20-00167
14. Reeves, S., Pelone, F., Harrison, R., Goldman, J., & Zwarenstein, M. (2017). **Interprofessional collaboration to improve professional practice and healthcare outcomes.** *Cochrane Database of Systematic Reviews*, CD000072. https://doi.org/10.1002/14651858.CD000072.pub3
15. Sung, H., Ferlay, J., Siegel, R. L., Laversanne, M., Soerjomataram, I., Jemal, A., & Bray, F. (2021). **Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries.** *CA: A Cancer Journal for Clinicians, 71*(3), 209–249. https://doi.org/10.3322/caac.21660
16. Topol, E. J. (2019). **High-performance medicine: The convergence of human and artificial intelligence.** *Nature Medicine, 25*(1), 44–56. https://doi.org/10.1038/s41591-018-0300-7
17. World Health Organization. (2021). **Ethics and governance of artificial intelligence for health.** WHO Press.

https://www.who.int/publications/i/item/9789240029200