

Ethical Leadership in Medical Laboratory Technology (MLT) Education and Management

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ABSTRACT

This study is grounded in the importance of ethical leadership in the management of Medical Laboratory Technology (MLT) laboratories, which play a pivotal role in ensuring service quality, workplace safety, and professional accountability within educational and healthcare settings. The study aims to integrate the concept of ethical leadership with moral philosophy to understand their combined role in supporting effective and sustainable laboratory management practices. A systematic literature review was conducted, analyzing relevant sources concerning ethical leadership, moral philosophy, and health laboratory management. The findings indicate that moral philosophical principles such as deontology, utilitarianism, virtue ethics, and the ethics of care serve as the normative foundation for decision-making by laboratory leaders. Ethical leadership acts as a bridge between moral values and operational practices by fostering a safety culture, enhancing personnel accountability, and maintaining sustainable service quality. Furthermore, ethics education and leadership development are deemed essential for shaping the professional character of laboratory and healthcare personnel, thereby directly impacting the quality of diagnostic results and patient safety. In conclusion, MLT laboratory leadership should be viewed as a moral practice rooted in robust ethical principles and manifested through ethical policies and organizational culture, thereby supporting the sustainability of service quality and safety in laboratory management.

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1. INTRODUCTION

The introduction to this article comprehensively explains the importance of Medical Laboratory Technology (TLM) laboratories in supporting the education of healthcare professionals and the delivery of quality healthcare services. The authors successfully contextualize the research by demonstrating that the laboratory serves not merely as a facility for technical diagnostics but also as an environment for fostering professional values, ethics, and moral responsibility among healthcare

personnel (Case et al., 2011). Furthermore, the article outlines various ethical challenges inherent in laboratory management such as occupational safety, biosafety, biosecurity, hazardous waste management, data integrity, and decision-making under resource constraints (Zikra et al., 2025).

The authors also examine the evolution of the concept of ethical leadership, linking it to moral philosophy as a foundation for managerial decision-making. The literature review is pertinent and highlights a research gap regarding the integration of ethical leadership, moral philosophy, and TLM laboratory management. The research objective is clearly stated: to analyze and synthesize literature concerning educational and laboratory leadership ethics from the perspective of moral philosophy. This introduction establishes a robust theoretical basis for the study and articulates the urgency of the research. However, despite presenting various theories and prior research findings, the authors have not explicitly formulated the research questions or the conceptual framework to be employed in the analysis; consequently, the research focus could be further clarified.

2. METHODS

The research method employed in this article is a Systematic Literature Review (SLR), adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. This method aligns with the research objective, which focuses on synthesizing literature regarding ethical leadership, moral philosophy, and laboratory management within the field of Medical Laboratory Technology (MLT). The authors systematically outline the research stages, ranging from study design, literature search, and the establishment of inclusion and exclusion criteria to article selection, data extraction, and thematic synthesis. Data were sourced from reputable databases such as Scopus, PubMed, Web of Science, and Google Scholar covering publications from 2001 to 2025. The use of combined keywords and Boolean operators demonstrates a robust approach to securing relevant and comprehensive literature. Furthermore, the application of inclusion and exclusion criteria helps ensure the objectivity and quality of the sources used. Data analysis utilized a thematic approach to identify key themes related to ethical leadership, moral philosophy, biosafety culture, and laboratory management. The explanation regarding the application of PRISMA guidelines and the data validation process via cross-checking further strengthens the credibility of the findings. However, the article does not provide detailed information on the number of articles selected at each stage or the specific quality assessment instruments used for the literature. The absence of such information limits the ability to fully evaluate the quality of the analyzed evidence. Overall, the research method is appropriate for a review study and effectively supports the achievement of the research objectives in a systematic and structured manner.

3. FINDINGS AND DISCUSSION

A thematic synthesis of the articles meeting the inclusion criteria identified four interconnected themes explaining the relationship between moral philosophy, ethical leadership, and management in Medical Laboratory Technology (MLT) laboratories. The first theme is moral philosophy as the normative foundation of ethical leadership. The literature indicates that perspectives such as deontology, utilitarianism, virtue ethics, and the ethics of care underpin the formation of a leader's moral reasoning. These philosophical approaches provide a conceptual framework for decision-making oriented toward responsibility, fairness, and the common good. The second theme is ethical leadership as a manifestation of moral values within the laboratory organization. Various studies emphasize that integrity, honesty, transparency, accountability, and fairness are key characteristics of leaders capable of fostering a professional and ethical work environment. The third theme is the influence of ethical leadership on laboratory management practices. Leadership grounded in ethical values contributes to the implementation of biosafety, biosecurity, occupational health and safety (OHS), laboratory waste management, and laboratory information management systems, as well as the consistent execution of quality assurance. The fourth theme is the impact of ethical leadership on organizational culture and the quality of laboratory services. The literature shows that the application of ethical leadership is

associated with an enhanced safety culture, adherence to standard operating procedures, improved quality of laboratory services, and increased public trust in MLT laboratory services.

Research findings indicate that ethical leadership in Medical Laboratory Technology (TLM) laboratory management cannot be understood merely as an administrative or technical function. Ethical leadership is a moral practice rooted in ethical philosophy and manifested through professional behavior in laboratory management. These results reinforce the view that leadership effectiveness is heavily influenced by a leader's ability to internalize moral values and apply them during decision-making processes. Moral philosophy serves as the conceptual foundation guiding leaders as they navigate the various ethical dilemmas that arise within the laboratory environment. A deontological approach emphasizes the importance of adhering to professional rules and standards, whereas utilitarianism encourages decision-making that yields the greatest benefit for the safety of patients, laboratory personnel, and the public. Meanwhile, virtue ethics and the ethics of care strengthen the dimensions of character, empathy, and social responsibility within leadership practice. The findings also demonstrate that ethical leadership acts as a bridge between philosophical values and the implementation of laboratory management systems. Leaders possessing high integrity and ethical commitment tend to be more consistent in ensuring the implementation of biosafety, biosecurity, occupational health and safety (OHS), waste management, laboratory information systems, and quality assurance. Thus, moral values do not remain at a conceptual level but are translated into policies, procedures, and operational practices that support laboratory performance. Furthermore, a synthesis of the literature indicates that ethical leadership contributes to the establishment of a safety culture and a quality culture within the laboratory organization. A work environment built upon trust, fairness, and accountability fosters adherence to operational standards and enhances personnel engagement in maintaining service quality. Ultimately, these conditions lead to improved test result quality, workplace safety, and public trust in TLM laboratories. Overall, the results of this study confirm that the integration of moral philosophy and ethical leadership constitutes a strategic element in developing TLM laboratory management that is oriented toward safety, quality, professionalism, and sustainable service. Thus, strengthening the ethical competence of laboratory leaders needs to be a crucial part of human resource development and modern laboratory governance.

2.2. Gambar, . Thematic synthesis of ethical leadership and moral philosophy in TLM laboratory management



Figure 3. Thematic synthesis of ethical leadership and moral philosophy in TLM laboratory management

The findings indicate that ethical leadership in Medical Laboratory Technology (TLM) management cannot be understood merely as a managerial or technical function. Instead, it is a moral practice grounded in philosophical reasoning and professional values. Consistent with previous studies, leadership effectiveness in a laboratory setting is closely linked to a leader's ability to internalize moral principles and translate them into day-to-day operational decisions. This synthesis further demonstrates that ethical leadership serves as a mediating mechanism between abstract moral philosophy and concrete laboratory practice, reinforcing the laboratory leader's role as a moral agent responsible for both organizational performance and ethical accountability.

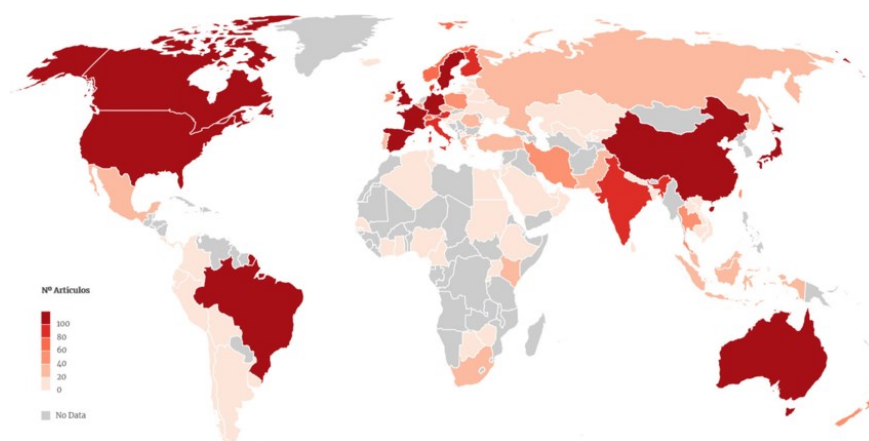


Figure 4. State Diagram

Tabel 1. Summary table of article discussion (review results)

No	Judul Artikel / Buku	Fokus Bahasan Utama	Konteks/Domain	Temuan Utama yang Relevan
1	A Review of Ethical Leadership and Other Ethics-Related Leadership Theories	Konsep dan tipologi ethical leadership	Kepemimpinan organisasi	Ethical leadership berbeda dari gaya lain karena menekankan perilaku moral, role modeling, dan pengambilan keputusan etis.
2	Ethical Leadership in Education and Its Relation to Education Management Ethics	Kepemimpinan etis dalam pendidikan	Pendidikan	Kepemimpinan etis memengaruhi keputusan, komunikasi, keadilan, dan budaya organisasi berbasis nilai.
3	School Leaders' Practice of the Ethics of Care	Praktik etika kepedulian pemimpin sekolah	Pendidikan	Ethics of care menjadi pendekatan penting dalam membangun hubungan, empati, dan keadilan di organisasi pendidikan.
4	The SAGE Handbook of Leadership (selected chapter)	Kerangka teoritis kepemimpinan	Kepemimpinan (umum)	Kepemimpinan dipahami sebagai proses pengaruh sosial dan moral, bukan hanya fungsi administratif.

5	Etika Profesi dan Hukum Kesehatan	Etika normatif dan hukum kesehatan	Etika profesi kesehatan	Etika profesi menjadi dasar moral dalam praktik kesehatan dan pengambilan keputusan profesional.
6	Principles of Biomedical Ethics	Prinsip etika biomedis	Etika biomedis	Prinsip beneficence, non-maleficence, justice, dan autonomy relevan untuk penalaran etis di laboratorium.
7	Rethinking Health Professions Education: A Framework for Action	Reformasi pendidikan profesi kesehatan	Pendidikan kesehatan	Pendidikan profesi harus mengintegrasikan nilai, kepemimpinan, dan tanggung jawab sosial.
8	Eco-Ethical Leadership and Interprofessional Education	Kepemimpinan etis berorientasi keberlanjutan	Pendidikan kesehatan	Kepemimpinan etis mendukung kolaborasi lintas profesi dan tanggung jawab sosial-ekologis.
9	The Culture of Biosafety, Biosecurity, and Responsible Conduct in the Life Sciences	Budaya biosafety dan biosecurity	Biosafety & biosecurity	Keselamatan laboratorium sangat ditentukan oleh budaya dan kepemimpinan, bukan hanya SOP.
10	A Laboratory Information Management System for Biosafety and Efficiency	Sistem informasi laboratorium	Manajemen laboratorium	LIMS mendukung biosafety dan efisiensi, namun efektivitasnya bergantung pada kepemimpinan etis.
11	Manajemen Laboratorium Kesehatan	Tata kelola laboratorium kesehatan	Manajemen laboratorium	Fungsi manajemen (SDM, mutu, alat, K3) merupakan area implementasi kepemimpinan etis.
12	Leadership in Laboratory Medicine as the Key Quality Tool	Kepemimpinan dan mutu laboratorium medis	Laboratorium medis	Kepemimpinan adalah instrumen utama peningkatan mutu dan keselamatan pasien.
13	Ethical Leadership Effects on Medical Laboratory Personnel Accountability	Dampak kepemimpinan etis	SDM laboratorium	Kepemimpinan etis berpengaruh signifikan terhadap akuntabilitas dan perilaku profesional staf.
14	Occupational Health and Safety Management in Laboratories	K3 laboratorium	K3 keselamatan kerja	Kepemimpinan menentukan kepatuhan dan internalisasi praktik keselamatan kerja.
15	Ethical Issues in Laboratory Waste Management	Etika pengelolaan limbah laboratorium	Lingkungan & K3	Pengelolaan limbah merupakan tanggung jawab etis pemimpin laboratorium.

16	Health Services Management and Quality Improvement	Tata kelola dan mutu layanan	Layanan kesehatan	Mutu layanan dipengaruhi kepemimpinan, budaya organisasi, dan tata kelola etis.
17	Public Health Ethics and Leadership	Etika dan kepemimpinan kesehatan masyarakat	Kesehatan masyarakat	Kepemimpinan etis berkontribusi pada kepercayaan publik dan keselamatan sistem kesehatan.
18	Professional Ethics in Health Education	Etika profesional dalam pendidikan	Pendidikan profesi	Pendidikan etika penting untuk pembentukan identitas profesional tenaga kesehatan.
19	Laboratory Quality Assurance and Ethical Responsibility	Jaminan mutu laboratorium	Mutu laboratorium	Jaminan mutu memerlukan komitmen etis dan kepemimpinan yang konsisten.
20	Leadership and Organizational Culture in Healthcare	Budaya organisasi kesehatan	Manajemen kesehatan	Budaya etis organisasi dibentuk oleh nilai dan teladan pemimpin.
21	Ethical Decision-Making in Healthcare Organizations	Pengambilan keputusan etis	Organisasi kesehatan	Filsafat moral membantu pemimpin menghadapi dilema etis kompleks.
22	Ethics Education for Health Professionals	Pendidikan etika tenaga kesehatan	Pendidikan kesehatan	Pendidikan etika meningkatkan sensitivitas moral dan tanggung jawab profesional.
23	Leadership, Accountability, and Professionalism in Clinical Laboratories	Kepemimpinan dan profesionalisme	Laboratorium klinik	Akuntabilitas dan profesionalisme staf berkorelasi dengan kualitas kepemimpinan.

A synthesis of these 23 sources reveals that the most consistent finding is that ethical leadership acts as a "bridge" between moral values (moral philosophy) and actual management practices in Medical Laboratory Technology (TLM) laboratories. In the educational realm, ethical leadership is understood as a leader's ability to uphold integrity, fairness, and exemplary conduct in decision-making and governance, thereby shaping a value-based institutional culture. This is strongly evident in the literature on ethical leadership in education, which emphasizes fairness, honesty, and equal treatment as the core of management ethics (e.g., in the contexts of school leadership and educational management ethics). A second finding from the laboratory and biosafety literature indicates that laboratory quality and safety cannot be sustained solely by SOPs and regulations; rather, they rely heavily on the organizational culture cultivated by leaders—encompassing compliance, incident reporting, the habitual practice of safety measures, and professional responsibility. Reviews regarding biosafety and biosecurity cultures emphasize the importance of "responsible conduct" as a component of an ethical ecosystem that must be internalized by the organization, rather than merely documented. From a managerial-technological perspective, the concept of LIMS (Laboratory Information Management Systems) for biosafety demonstrates that safety governance can be strengthened through information systems that integrate data on projects, personnel, materials, and equipment; however,

ethical leadership remains essential to ensure that such technology is applied with discipline and fairness. A third finding, supported by evidence from medical laboratory literature, confirms that leadership serves as a "quality tool." Effective laboratory leaders do not merely handle administrative duties; they ensure staff competence and mentoring, oversee significant decision-making, and foster working conditions that support diagnostic quality and patient safety. Reviews of medical laboratory leadership also indicate that international organizations (such as the WHO, CDC, and IFCC) prioritize the development of managerial and leadership competencies as part of efforts to enhance laboratory service quality. This finding is further reinforced by empirical studies demonstrating the influence of ethical leadership on laboratory personnel accountability—suggesting that a leader's ethical stance can translate into professional staff behavior.

Ultimately, the literature points to a single conceptual synthesis: moral philosophy provides a framework for moral reasoning when facing dilemmas, while ethical leadership operationalizes that reasoning into policies, culture, and practices within the Medical Laboratory Technology (TLM) laboratory. Deontology reinforces adherence to SOPs and codes of ethics; utilitarianism aids in weighing safety against the greatest benefit; virtue ethics emphasizes the leader's character (integrity, honesty, responsibility); and the ethics of care strengthens the dimensions of empathy and the protection of vulnerable parties (staff, students, patients, and the environment). Thus, the primary contribution of this review is positioning the head or manager of the TLM laboratory as a moral agent who transforms values into systems: OHS (Occupational Health, Safety, and Environment), biosafety and biosecurity, waste management, quality assurance, and data-driven governance.

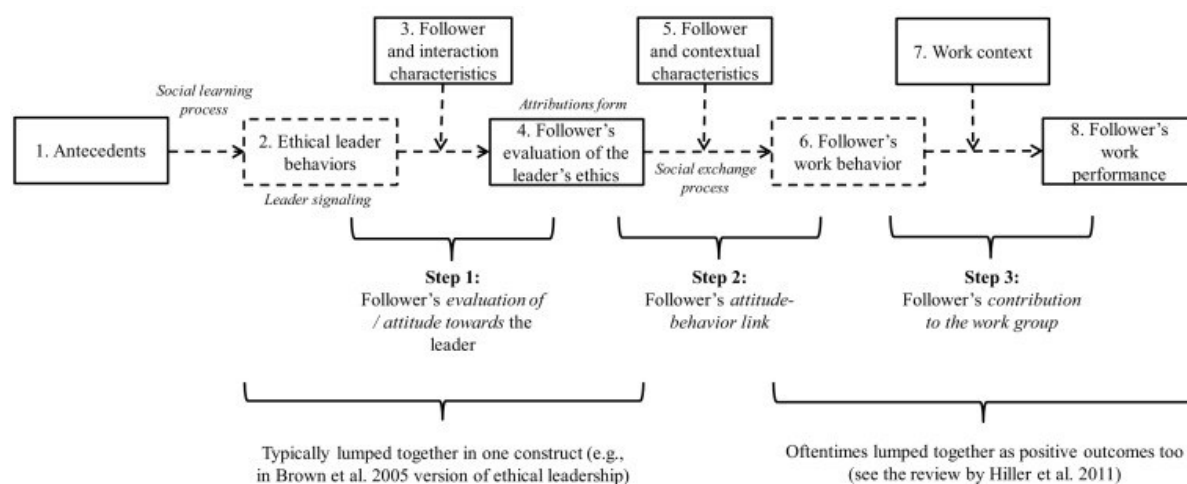


Figure 5. Mind map

The mind map presented in this study synthesizes key themes emerging from a systematic literature review on ethical leadership and moral philosophy within the management of Medical Laboratory Technology (MLT) laboratories. At the center of this mind map lies ethical leadership in MLT laboratory management, representing the core concept that connects moral theory, leadership practices, educational processes, and operational outcomes. This synthesis demonstrates that ethical leadership functions not merely as a managerial attribute but as a moral practice that translates abstract ethical principles into concrete laboratory governance.

At a foundational level, the mind map highlights moral philosophy as the normative basis for ethical leadership. The reviewed literature consistently refers to major moral perspectives—such as deontology, utilitarianism, virtue ethics, and the ethics of care—as essential frameworks for ethical reasoning within a professional context. Deontological ethics emphasizes adherence to standard operating procedures, codes of conduct, and regulatory compliance, all of which are crucial in a laboratory environment characterized by high-risk activities. The utilitarian approach supports

decision-making processes that prioritize collective safety, patient well-being, and the optimal allocation of limited resources. Virtue ethics shifts the focus to the moral character of the laboratory leader, highlighting qualities such as integrity, responsibility, and practical wisdom. Meanwhile, the ethics of care introduces a relational dimension, emphasizing empathy, concern for vulnerable stakeholders, and moral responsibility toward laboratory personnel, students, patients, and the environment.

Building upon this moral foundation, the mind map identifies ethical leadership as the key mechanism through which moral principles are operationalized. Ethical leadership is characterized by integrity, fairness, accountability, and moral decision-making, as well as the ability to serve as a role model within the organization. The reviewed studies indicate that ethical leadership acts as a connecting force linking philosophical values with day-to-day managerial practices. Leaders who consistently embody ethical values are more likely to build trust, foster ethical behavior among staff, and maintain a culture of responsibility within the laboratory setting.

The third major component of the mind map focuses on the domain of laboratory management as a primary area for the implementation of ethical leadership. This domain encompasses biosafety and biosecurity, occupational health and safety (OHS), waste management, quality assurance, laboratory information management systems, and human resource development. The literature reveals that ethical challenges in these domains often arise not from a lack of technical knowledge, but from deficiencies in leadership commitment, ethical awareness, and organizational culture. Ethical leadership plays a crucial role in ensuring that safety protocols are consistently applied, risks are communicated transparently, and technological systems are used responsibly to enhance efficiency and safety.

Beyond operational considerations, the mind map emphasizes the role of education and professional development in sustaining ethical leadership. Laboratories within educational and healthcare institutions serve as spaces where professional identities and ethical values are shaped. The reviewed literature highlights the importance of integrating ethics education and leadership development into health professional education, particularly in laboratory-based training. In this context, ethical leadership supports not only compliance with standards but also the internalization of professional values among students and laboratory personnel, thereby strengthening long-term ethical competence.

Finally, the mind map illustrates the outcomes and impacts of integrating moral philosophy and ethical leadership into Medical Laboratory Technology (TLM) management. Across the reviewed studies, ethical leadership is linked to the development of a strong safety culture, enhanced professional accountability, improved service quality, and increased patient and public trust. Collectively, these outcomes contribute to sustainable laboratory governance, wherein ethical considerations are embedded in strategic planning and daily operations. This synthesis thus suggests that ethical leadership grounded in moral philosophy is a crucial factor in the effectiveness, safety, and social legitimacy of laboratories.

4. CONCLUSION

This systematic review demonstrates that ethical leadership grounded in moral philosophy is a crucial factor in the effective and responsible management of Medical Laboratory Technology (MLT) laboratories, whether in educational or healthcare settings. The reviewed literature consistently indicates that laboratory management challenges—such as biosafety, biosecurity, occupational health and safety, waste management, quality assurance, and data management—cannot be adequately addressed solely through technical standards and regulatory compliance. Instead, these challenges require leadership practices explicitly rooted in ethical reasoning and moral responsibility.

The findings reveal that moral philosophy provides a normative foundation for ethical leadership within the laboratory environment. Deontological principles reinforce adherence to standard operating procedures and professional codes of ethics; utilitarian reasoning supports decision-making that prioritizes collective safety and patient well-being; virtue ethics emphasizes the moral character of

laboratory leaders—including integrity, responsibility, and practical wisdom—while the ethics of care highlights relational accountability, empathy, and the protection of vulnerable parties. Collectively, these perspectives offer laboratory leaders a comprehensive framework for navigating the ethical dilemmas that frequently arise in complex, high-risk laboratory environments.

Furthermore, this review confirms that ethical leadership serves as a mediating mechanism between abstract moral values and concrete laboratory management practices. Leaders who consistently model ethical behavior foster a strong safety culture, enhance professional accountability among laboratory personnel, and promote trust within educational institutions and healthcare systems. The empirical and conceptual evidence reviewed in this study underscores that leadership quality significantly influences laboratory performance, staff behavior, and the sustainability of quality and safety initiatives.

It is also important to note that this highlights the role of the laboratory as a setting for professional and ethical development, particularly within health professional education. Ethical leadership in Medical Laboratory Technology (TLM) laboratories contributes not only to operational excellence but also to the internalization of professional values among students and early-career practitioners. This reinforces the need to integrate ethics education and leadership development into laboratory-based training and institutional capacity-building programs.

In conclusion, this provides a conceptual synthesis positioning the laboratory leader as a moral agent responsible for translating moral philosophy into ethical governance, organizational culture, and daily practices. Future research should empirically test the ethical leadership model across various laboratory contexts, assess its impact on safety and quality outcomes, and develop evidence-based training frameworks for ethical leadership in laboratory management. From a practical perspective, policymakers and educational institutions are encouraged to incorporate moral philosophy and ethical leadership competencies into laboratory management standards, professional development programs, and accreditation frameworks to ensure sustainable, ethical, and high-quality laboratory services.

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