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Bridging Law, Ethics, and Learning the Urgent Need for Electronic Medical Record Integration in Clinical

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ABSTRACT

The rapid advancement of health information technology has accelerated the transition of medical documentation from traditional paper-based records to Electronic Medical Records (EMRs). In the context of medical education, clinical students are expected to master accurate, efficient, and ethically responsible documentation practices as part of their professional competencies. However, the implementation of EMRs within teaching hospitals and medical schools continues to face significant challenges, particularly related to legal uncertainty, patient privacy protection, and the absence of comprehensive institutional policies governing student access and responsibility. This literature review aims to synthesize current evidence regarding the legal and ethical implications of EMR use by medical students and to assess the urgency of integrating structured EMR training into undergraduate and clinical medical curricula. A qualitative literature review was conducted using 22 relevant national and international studies published within the last decade. The findings indicate that EMR utilization contributes positively to the development of students' clinical documentation skills, clinical reasoning, and readiness for professional practice in digital healthcare environments. Nevertheless, unresolved issues remain, including the legal status of student-generated medical records, potential violations of patient confidentiality, and unclear liability frameworks when documentation errors occur. Additional barriers identified include limited formal training, restrictive access policies, and inconsistent supervision during clinical rotations. This review highlights the urgent need for clear national regulations, standardized institutional policies, explicit education on digital health ethics, and structured EMR training programs within medical education. Such measures are essential to ensure legal compliance, safeguard patient rights, and adequately prepare future physicians to practice responsibly in increasingly digitalized healthcare systems.

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INTRODUCTION

Rumah Digital transformation in healthcare has fundamentally reshaped how patient data are recorded, stored, and utilised. The Electronic Medical Record (EMR)—a longitudinal, structured digital repository of patient information—has replaced paper-based documentation in many health systems to improve accessibility, efficiency, and clinical decision-making. In Indonesia, this transition was formalised through the Ministry of Health Regulation No. 24 of 2022, which mandates EMR adoption across healthcare facilities to ensure standardisation, confidentiality, and continuity of care (Indonesian Ministry of Health, 2022). Despite this regulatory push, national surveys reveal uneven implementation: only about half of hospitals report some degree of EMR use, with fewer than 16% operating systems optimally (Larasati et al., 2024). Significant technical barriers, infrastructural limitations, and fragmented institutional policies continue to impede progress, particularly in regions where digital infrastructure remains limited (Wilson & Khansa, 2018).

Beyond infrastructure, EMR adoption introduces complex legal and ethical challenges. Indonesian law recognises the patient as the rightful owner of the content of medical records, while health facilities own the medium that stores them. At the same time, Health Law No. 17/2023 and Medical Practice Law No. 29/2004 emphasise confidentiality, data protection, and patients' rights to accessible and accurate information (Indonesia, 2004; Indonesia, 2023). Ethical frameworks such as Beauchamp and Childress's principles of autonomy, beneficence, non-maleficence, and justice acquire new dimensions in digital contexts, expanding to include data integrity, authentication, access control, and non-repudiation (Beauchamp & Childress, 2019; Janarthanan et al., 2024). Breaches of confidentiality or unauthorised access can result in reputational harm, loss of trust, and potential litigation for both practitioners and training institutions (Budiyanti et al., 2019; Ginting, 2024). Compounding these issues, current regulations do not clearly define the legal validity of medical student documentation nor specify the liability boundaries when student-related EMR misuse leads to adverse outcomes (Izza & Lailiyah, 2024; Novianti & Bakhtiar, 2024).

This legal and ethical ambiguity has direct implications for medical education. Students are expected to develop digital health literacy and documentation proficiency as part of core competencies, yet many teaching hospitals restrict student EMR access to read-only modes due to medico-legal concerns. Such restrictions hinder skill development, limit clinical engagement, and often lead to unsafe workarounds such as shared logins or untracked edits. International evidence shows that supervised, structured EMR use enhances documentation accuracy, ethical behaviour, and preparedness for clinical practice, whereas poorly defined access policies undermine training quality (Heiman et al., 2014; Welcher et al., 2018). Educational institutions therefore face a critical challenge: balancing patient safety and legal accountability with the need to train digitally competent future physicians.

Despite a growing body of research on EMR policy and technology, few studies integrate the legal, ethical, and educational perspectives required to guide medical schools and clinical training environments. Indonesian literature has largely focused on system implementation, infrastructure gaps, or general data security issues, with limited attention to student-specific liability or digital professionalism education (Budiyanti et al., 2019; Larasati et al., 2024). This review seeks to address these gaps by synthesising global and Indonesian evidence on the legal frameworks, ethical imperatives, and educational strategies required to support safe and effective EMR use by medical students.

Electronic Medical Records (EMR)—or Rekam Medis Elektronik (RME)—have become a foundational component of modern healthcare systems, enabling secure, longitudinal, and interoperable documentation of patient information. In Indonesia, the government's digital health transformation is anchored in Ministry of Health Regulation No. 24 of 2022, which mandates EMR adoption in all health facilities (Indonesian Ministry of Health, 2022). Article 3(1) requires universal implementation, while Article 7(3) stipulates that facilities develop Standard Operating Procedures (SOPs) suited to their technical capabilities and resources.

Despite these mandates, the implementation landscape remains uneven. Geographic disparities are significant: health facilities in western Indonesia, especially Java benefit from stronger infrastructure, while eastern regions continue to experience limited internet connectivity, insufficient IT systems, and workforce shortages. A national survey revealed that although 50% of hospitals reported EMR use, only 16% operated their systems effectively (Larasati et al., 2024). Further analysis from the Directorate of Referral Health Services showed that as of 2023, only 11.23% of hospitals possessed fully functional EMR systems, highlighting persistent structural challenges (Izza & Lailiyah, 2024).

Beyond technical issues, substantial legal and ethical uncertainties persist. Although Indonesian law outlines patient ownership of record content and facility ownership of the medium (Indonesian Ministry of Health, 2022), no regulation clearly defines the legal standing of student-authored entries in EMRs nor delineates liability if negligence or data breaches occur as a result of student documentation (Indonesia, 2004; Indonesia, 2023). This creates tension for academic hospitals tasked with balancing medico-legal responsibilities and educational obligations.

Ethically, EMR use in medical education must be anchored in established principles of autonomy, beneficence, non-maleficence, and justice (Beauchamp & Childress, 2019). In digital practice, these principles extend to include privacy protection, data integrity, secure authentication, role-based access, and non-repudiation safeguards (Janarthanan et al., 2024; Budiyanti et al., 2019). Misuse of EMRs—such as unauthorised access, shared credentials, or erroneous copy-paste practices—can compromise patient trust, threaten institutional accountability, and expose students to disciplinary consequences (Ginting, 2024).

Global experiences demonstrate that policy clarity enhances both educational outcomes and patient safety. For example, the 2018 U.S. CMS revision allowing supervising physicians to verify, rather than rewrite, student notes reduced workflow burden while improving documentation accountability (Gliatto et al., 2009). Research by Heiman et al. (2014) and Welcher et al. (2018) confirms that supervised EMR documentation enhances accuracy, ethical behaviour, and readiness for professional practice. Conversely, restrictive or ambiguous access policies promote unsafe workarounds that undermine professionalism (Jones et al., 2017).

Indonesian scholarship on EMR remains dispersed. Studies have examined ethical dilemmas, confidentiality risks, infrastructure gaps, or legal theory, but few have integrated these issues into a coherent framework addressing medical student training (Budiyanti et al., 2019; Larasati et al., 2024; Izza & Lailiyah, 2024; Novianti & Bakhtiar, 2024). International models—including structured EMR navigation training, sandbox EMR platforms, and supervised real-patient documentation—have demonstrated substantial improvements in competence and digital professionalism (Herrmann-Werner et al., 2021; Mollart et al., 2023; Ng et al., 2023). Yet such approaches remain rare in Indonesia, where no unified national guidance governs student EMR access, documentation validity, or liability boundaries.

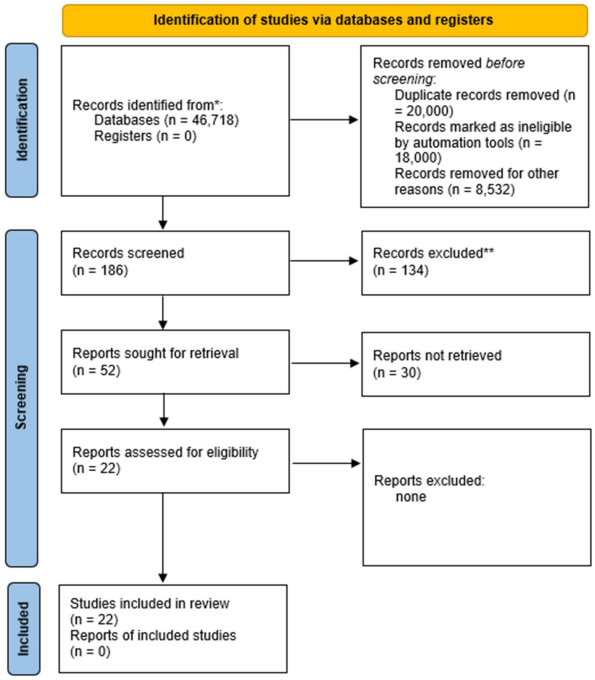
METODE

This literature review included studies retrieved from PubMed, Wiley Online Library, Taylor & Francis, Springer Nature, and ProQuest using the keywords "Electronic Medical Record," "Medical Students," "Ethics," and "Legal Issues." Inclusion criteria were studies discussing legal, ethical, or educational aspects of EMR in medical education, including quantitative, qualitative, scoping, narrative, and policy analyses. Studies solely addressing technical EMR functions without relevance to clinical education were excluded. A total of 22 articles were selected.

Study Selection Process

A total of 46.718 records were initially retrieved from PubMed, Wiley Online Library, Taylor & Francis, Springer Nature and ProQuest using the search terms "Electronic Medical Record" AND "Medical Students" AND "Ethics" AND "Legal Issues". After automatic removal of duplicates, 186 records remained for title and abstract screening. Of these, 164 were excluded because they focused solely on technical system design, interoperability frameworks, or EMR adoption metrics without reference to medical education, legal issues, or ethics.

The remaining 22 full-text articles were assessed for eligibility and ultimately included in this review. These comprised quantitative studies (surveys, cohort and pre–post interventions), qualitative studies (interviews, ethnographies), scoping or narrative reviews, policy analyses, and conceptual papers/commentaries. Policy commentaries and narrative/legal reviews were deliberately included because the topic under investigation—law, ethics, and education in EMR use by medical students—relies not only on empirical data but also on legal interpretation, ethical reasoning, and policy frameworks. Doctoral dissertations and conceptual analyses were included when they offered original data or unique perspectives (e.g., liability analysis, EMR metadata in litigation, curriculum design implications) not otherwise available in peer-reviewed trials. Purely technical IT papers or papers without educational or medico-legal relevance were excluded.



RESULTS

Table 1. Characteristics of included studies[23-48]

No	Author's Name	Title	Research Place	Method	Results
1	Heiman HL, Rasminsky S, Bierman JA, Evans DB, Kinner KG, Stamos J, Martinovich Z, McGaghie WC	Medical students' observations, practices, and attitudes regarding electronic health record documentation	Northwestern University Feinberg School of Medicine, USA	Cross-sectional survey	97% of students routinely used EMRs; frequent copy-paste behaviors; ethical tension between efficiency and professionalism
2	Brisson GE, Neely KJ, Tyler PD, Barnard C	Should medical students track former patients in the electronic health record? An emerging ethical conflict	Northwestern University, USA	Conceptual/ethical analysis	Tracking former patients enhances learning but raises privacy issues; recommends national guidelines to balance education and patient autonomy
3	Gliatto P, Masters P, Karani R	Medical Student Documentation in the Medical Record: Is It a Liability?	USA	Narrative review	Student notes enhance learning but pose legal/billing risks; recommends supervised EMR use and clear national policy
4	Welcher CM, Hersh W, Takesue B, Elliott VS, Hawkins RE	Barriers to Medical Students' Electronic Health Record Access Can Impede Their Preparedness for Practice	USA	Retrospective observational	Students wrote avg. 1.7 notes/day; documentation skills improved with experience; limiting access reduces preparedness
5	Brisson GE, Barnard C, Tyler PD, Liebovitz DM, Neely KJ	A Framework for Tracking Former Patients in the Electronic Health Record Using an Educational Registry	Northwestern University, USA	Conceptual framework	Proposes "Educational Registry" to ethically track former patients with privacy safeguards and monitoring
6	McLean TR, Burton L, Haller CC, McLean PB	Electronic Medical Record Metadata: Uses and Liability	VA Medical Center Kansas, USA	Retrospective observational + legal analysis	EMR metadata reveals user behavior; can be used in litigation; poses malpractice liability risk
7	Solarte I, Könings KD	Discrepancies between perceptions of students and deans regarding restricting EMR use	Colombia	Comparative cross-sectional survey	Only 50% schools have EMR policies; restricting student notes harms learning; deans more concerned about liability
8	Brisson GE, Neely KJ, Tyler PD, Barnard C	Privacy Versus Confidentiality: More on EHR for Learning	USA	Ethical correspondence	Highlights privacy vs confidentiality differences; need clear guidance to avoid "snooping" perceptions
9	Jones RG, Mehta MM, McKinley RK	Medical student access to EMR in UK primary care	UK	Letter to the editor / ethical discussion	Stresses privacy/confidentiality risks of tracking; calls for modern ethical guidelines

					for EMR use
10	Almulhem JA	Medical students' experience with accessing medical records in Saudi Arabia	Saudi Arabia	Descriptive study (survey)	62.8% students had EMR access, mostly read-only; want fuller access and documentation training; legal concerns limit use
11	Edmiston N, Hu W, Tobin S, Bailey J, Joyce C, Reed K, Mogensen L	"You're actually part of the team": transitional role from student to doctor	Australia	Qualitative interviews	EMR access essential for effective team contribution; legal limits on prescribing highlight boundary needs
12	Veikkolainen P, Tuovinen T, Kulmala P, et al.	Evolution of Medical Student Competencies and Attitudes in Digital Health 2016–2022	Finland	Comparative cross-sectional	Knowledge of national patient portals rose; EMR skill level stagnated; underscores need for structured training
13	Ramkumar S, Khan I, Chan SCC, Jerjes W, Majeed A	From Clicks to Care: EHR Navigation Training	UK	Cohort pre–post	Confidence in EHR use rose from 28%→87%; improved data retrieval speed and accuracy
14	Hägg-Martinell A, Hult H, Henriksson P, Kiessling A	Learning opportunities in internal medicine ward: ethnographic study	Sweden	Ethnography	Student engagement limited by short placements; learning depends on supervisor invitation and ward culture
15	Herrmann-Werner A, Holderried M, Loda T, Malek N, Zipfel S, Holderried F	Navigating Through EHR: Student Perspectives & Training	Germany	Longitudinal pre–post	Training improved knowledge but confidence remained low; need longitudinal EMR curriculum
16	Hoonpongsimanont W, Velarde I, Gilani C, Louthan M, Lotfipour S	Assessing medical student documentation using simulated charts	USA	Prospective chart review	98.9% of notes incomplete per billing standards; documentation gaps in ROS, physical exam, history
17	Mollart L, Stubbs M, Noble D, Koizumi N, Crowfoot G	Student confidence & knowledge via on-ward EMR simulation	Australia	Quasi-experimental	On-ward EMR simulation improved confidence and clinical readiness; bridges theory-practice gap
18	Ng L, Osborne S, Eley R, Tuckett A, Walker J	Nursing students' perceptions of simulated EMR	Australia	Descriptive study	Students found EMR simulation easy, useful; technical issues reported; suggests progressive EMR integration
19	Taylor H, Brumitt G, Harle CA, Johnston A, Williams KS, Vest JR	Student perceptions of teaching EMR in health admin education	USA	Survey	Students valued EMR exposure but noted lack of legal/ethical training; recommend structured EMR curriculum
20	Bloice MD, Simonic KM, Holzinger A	Casebook: virtual patient app using EHR	Austria	Educational technology case	Virtual EHR app improved decision-making training; potential model for safe EMR learning
21	Meilia PDI, Christianto GM, Librianty N	Buah Simalakama Rekam Medis	Indonesia	Narrative review	EMR improves efficiency but risks privacy violations and unclear

		Elektronik: Manfaat vs Dilema Etis			liability; urges ethics integration in curricula
22	Herlambang PM, Budiyanti RT	Urgensi Kurikulum Pendidikan Kedokteran di Era Digital	Indonesia	Policy analysis	Calls for urgent EMR curriculum development with legal & ethical frameworks for digital healthcare

The present review highlights that Electronic Medical Records (EMRs) occupy a paradoxical position within medical education: they are essential tools for preparing digitally competent, practice-ready physicians, yet they remain burdened by unresolved legal and ethical complexities. This tension is especially pronounced in Indonesia, where the national mandate for EMR adoption established by Permenkes No. 24/2022 has not been accompanied by detailed regulatory guidance that addresses medical student access, documentation validity, or liability boundaries (Indonesian Ministry of Health, 2022). International evidence emphasises that well-defined policies improve both documentation quality and patient safety, whereas unclear or restrictive access fosters unsafe workarounds such as shared logins or unverified edits, undermining both professionalism and data integrity (Heiman et al., 2014; Jones et al., 2017; Welcher et al., 2018). By synthesising global findings with Indonesian scholarship, the review identifies persistent gaps in legal clarity, digital ethics training, and structured supervision—gaps that collectively impede the development of competent, accountable, and ethically grounded medical graduates.

1. Legal Ambiguity and Institutional Risk

Without urgent regulatory clarification, EMR training risks becoming an ethical liability rather than an educational asset. International studies consistently show that although medical students routinely contribute to electronic documentation, uncertainty persists regarding the legal standing of student-authored notes and the potential exposure of supervising physicians to malpractice claims should errors occur (Gliatto et al., 2009; Heiman et al., 2014). The growing use of EMR metadata in litigation further complicates this landscape: audit trails that record every user action can be scrutinised in court, meaning that even seemingly minor student edits may carry significant legal implications (McLean et al., 2013). Countries with clear national standards have mitigated these risks more effectively. For instance, the 2018 U.S. Centers for Medicare and Medicaid Services (CMS) policy revision allowed attending physicians to verify rather than re-document student notes, thereby preserving educational value while clarifying accountability and reducing administrative burden. In contrast, Indonesian regulations—while mandating EMR adoption—do not yet define the legal validity of student documentation or delineate liability boundaries between students, supervisors, and institutions (Indonesia, 2004; Indonesia, 2023). As a result, academic hospitals often resort to ad hoc policies that vary widely between institutions, generating inconsistent practices and potential institutional exposure. Clear, nationally standardised policies are therefore essential to safeguard both patients and trainees while supporting meaningful EMR-based education.

2. Ethical Fragility in the Digital Learning Environment

Ethically, EMR use exposes medical students to forms of risk and responsibility that differ markedly from those associated with paper records. Digital documentation enables rapid information sharing, but it also heightens the potential for breaches of confidentiality, inappropriate access, and compromised data integrity. Studies show that common shortcuts—such as copy-paste practices, shared login credentials, or browsing patient charts out of curiosity—can undermine accountability and erode professional identity among trainees (Heiman et al., 2014; Jones et al., 2017). Similarly, ethical dilemmas arise when students track former patients in EMRs to support learning; while such practices may enhance continuity of understanding and empathy, they can challenge principles of autonomy and privacy if conducted

without explicit consent or institutional oversight (Brisson et al., 2016; Brisson et al., 2018). These behaviours highlight the fragility of ethical norms within digital learning spaces, where the boundaries of acceptable access are not always intuitively understood by trainees.

Restrictive access policies—often implemented to mitigate liability—may inadvertently intensify ethical risks rather than reduce them. Evidence suggests that limiting students to read-only access or denying them individual login credentials can encourage unsafe workarounds, such as undocumented edits or the use of supervisors' accounts, which obscures audit trails and weakens accountability (Welcher et al., 2018; Solarte & Könings, 2017). Such practices undermine key digital-era extensions of classical bioethical principles, including integrity, authentication, and non-repudiation (Beauchamp & Childress, 2019; Janarthanan et al., 2024). Compounding this, Indonesian scholarship reveals inconsistent integration of digital ethics within medical curricula, leaving students aware of confidentiality obligations in theory but ill-prepared to navigate the nuanced ethical challenges of real-world EMR use (Budiyanti et al., 2019; Larasati et al., 2024).

Taken together, these findings underscore the need for structured and explicit digital ethics education that moves beyond abstract principles to applied scenarios involving privacy risks, documentation integrity, and responsible data stewardship. Without intentional curricular integration and clear institutional policies, students remain vulnerable to developing unsafe documentation habits that may persist into future clinical practice.

3. Educational Imperative: From Simulation to Supervised Practice

This review affirms that authentic, supervised engagement with EMRs is essential for developing competent and practice-ready graduates. Evidence consistently shows that students who actively document within clinical workflows acquire stronger clinical reasoning, more accurate documentation habits, and a deeper understanding of patient trajectories than those restricted to read-only access (Welcher et al., 2018; Heiman et al., 2014). Structured EMR induction programmes, navigation training, and progressive skill development models—beginning with simulation and advancing to supervised real-patient documentation—further enhance competence and confidence. For instance, dedicated EMR navigation training has been shown to significantly improve speed, accuracy, and self-efficacy in retrieving and synthesising digital clinical data (Ramkumar et al., 2025). Similarly, simulation-based EMR training, such as on-ward digital charting exercises or virtual patient platforms, has been associated with improved documentation readiness, enhanced situational awareness, and more seamless transition into clinical responsibilities (Mollart et al., 2023; Bloice et al., 2014; Ng et al., 2023).

International models offer clear examples of how educational design can mitigate ethical and legal risks while strengthening student competence. The Australian Academic EMR (AAeMR), for instance, provides students with a sandboxed training environment that mirrors real EMR interfaces but uses fictitious patient data, enabling learners to practise documentation, order entry, and clinical decision-making safely (Edmiston et al., 2021). Similar approaches, including longitudinal EMR curricula and tiered access systems matched to students' levels of training, have been shown to reduce privacy breaches, minimise unsafe workarounds, and promote responsible digital citizenship (Herrmann-Werner et al., 2021; Hoonpongsimanont et al., 2019).

Yet in Indonesia, few institutions incorporate structured digital health training or EMR simulation into their curricula. Most rely on ad hoc exposure in clinical rotations, which varies widely depending on hospital infrastructure, supervisor familiarity, and institutional policies (Izza & Lailiyah, 2024; Herlambang & Budiyanti, 2023). This inconsistency limits skill acquisition and perpetuates uncertainty about appropriate documentation behaviour, especially when students encounter environments where login sharing is normative or where they lack opportunities to practise decision-making within EMRs.

To meet modern healthcare demands, medical schools must adopt integrated, longitudinal training pathways that blend simulation-based learning with supervised clinical documentation. Such curricula should explicitly address digital professionalism, data stewardship, privacy protection, and responsible EMR use—ensuring that students develop not only technical proficiency but also the ethical fluency required for safe participation in digital healthcare ecosystems.

4. Policy and Research Gaps in the Indonesian Context

Despite global advances in EMR integration within medical education, Indonesian scholarship and policy development remain fragmented and reactive. Most local studies focus on infrastructural readiness, technical barriers, or broad legal principles, but few explicitly address the intersection of law, ethics, and educational practice as it relates to medical student involvement in EMR systems (Budiyanti et al., 2019; Larasati et al., 2024; Izza & Lailiyah, 2024). Much of the literature offers descriptive analyses rather than evaluative or intervention-based studies, limiting the ability of policymakers and educators to design evidence-informed strategies for safely integrating EMRs into clinical training. For example, while Izza and Lailiyah (2024) highlight the uneven adoption of EMRs and workforce constraints, and Novianti and Bakhtiar (2024) examine legal certainty in system implementation, neither provides operational guidance for supervision protocols, access controls, or student documentation workflows.

Comparatively, international models provide more detailed frameworks, including defined supervision requirements, audit mechanisms, and explicit guidance on student note verification—features notably lacking in Indonesian regulations (Gliatto et al., 2009; CMS policy change described in Welcher et al., 2018). In the absence of national standards, teaching hospitals develop their own internal rules, resulting in inconsistent access levels, documentation privileges, and liability interpretations across institutions. Such heterogeneity exposes both students and institutions to medico-legal risk and hinders the establishment of a unified baseline for digital competency.

Additionally, Indonesian research seldom evaluates the outcomes of EMR training interventions, such as improvements in documentation accuracy, privacy-preserving behaviours, or student confidence in navigating digital records. This stands in contrast to studies from Australia, Europe, and the United States, where robust evaluation frameworks have demonstrated the benefits of simulation-based EMR training, role-based access systems, and structured digital professionalism curricula (Edmiston et al., 2021; Herrmann-Werner et al., 2021; Hoonpongsimanont et al., 2019; Ramkumar et al., 2025). Without similar evaluative research, Indonesian medical schools and hospitals lack the empirical basis needed to justify curriculum reform or policy updates.

Finally, collaboration between medical educators, health informatics experts, legal scholars, and ethicists remains limited in Indonesia, resulting in siloed perspectives that fail to capture the complexity of EMR integration. A coordinated, interdisciplinary approach is necessary to develop context-sensitive policies that reconcile patient rights with educational imperatives, align institutional practices with national regulations, and prepare students for the ethical and legal challenges of digital healthcare delivery.

5. Integrating Law, Ethics, and Education: A Strategic Path Forward

Indonesia faces a pivotal opportunity to harmonise legal frameworks, ethical standards, and educational practices in order to modernise clinical training and support the safe integration of EMRs into everyday medical practice. Current regulations mandate EMR adoption but do not sufficiently articulate how student documentation should be supervised, validated, or incorporated into institutional liability structures (Indonesia, 2004; Indonesia, 2023). Without explicit national standards, inconsistencies across teaching hospitals persist, exposing students to unclear expectations and exposing institutions to unnecessary legal risk. Establishing uniform

policies that define student access rights, permission levels, verification workflows, and audit responsibilities would provide a critical foundation for accountable EMR participation in clinical education.

A strategic approach must also foreground digital professionalism and ethical stewardship as core clinical competencies. The ethical landscape of EMR use extends far beyond classical principles—incorporating data privacy, digital identity management, integrity of clinical information, and responsible secondary data use (Beauchamp & Childress, 2019; Janarthanan et al., 2024). Integrating these themes into medical curricula, not as supplemental topics but as longitudinal threads woven throughout preclinical and clinical training, is essential for preparing students to navigate complex digital environments. Scenario-based ethical training, simulated privacy breach analysis, reflective practice, and structured feedback on EMR use can help cultivate professional identity and foster safe documentation behaviours.

Infrastructure for training must likewise evolve. International models emphasise progressive exposure, beginning with sandbox EMR platforms, followed by structured practice in simulated clinical settings, and culminating in supervised real-patient documentation (Herrmann-Werner et al., 2021; Edmiston et al., 2021; Ramkumar et al., 2025). Such tiered pathways ensure that students develop competence gradually while minimising privacy risks and institutional liability. Although resource constraints across Indonesian health facilities vary, adapting these models—beginning with low-cost simulations or shared academic EMR platforms—would enable more equitable and standardised training nationwide.

Successful integration of law, ethics, and education also requires coordinated efforts among stakeholders. Collaboration between policymakers, medical educators, hospital administrators, ethicists, and health informatics professionals is essential to produce context-sensitive policies that reflect real-world clinical workflows. These collaborations should aim to synthesise regulatory mandates with educational objectives and operational realities, ensuring that EMR use promotes both patient protection and meaningful learning. Without such alignment, efforts to modernise medical training may remain fragmented, perpetuating the very risks that EMR reforms seek to resolve.

Ultimately, aligning legal clarity, ethical competence, and educational strategy represents the most promising path for preparing a generation of physicians who are digitally proficient, ethically grounded, and legally protected. Such integration would not only safeguard patient rights and institutional integrity but also accelerate Indonesia's progress toward a modern, equitable, and technologically capable healthcare system.

6. Expanding Digital Bioethics and Curriculum Innovation

Digital bioethics has evolved beyond the classical framework of autonomy, beneficence, non-maleficence, and justice, introducing new ethical domains shaped by rapidly advancing health information technologies. Contemporary EMR environments require competencies in data stewardship, informed e-consent, algorithmic fairness, digital identity protection, and responsible secondary use of health data—competencies that traditional medical curricula rarely address in a systematic manner (Beauchamp & Childress, 2019; Janarthanan et al., 2024). As EMRs increasingly interface with clinical decision support systems, predictive algorithms, and population health analytics, students must understand how data quality, structural biases, and incomplete records can propagate inequities and influence clinical judgments.

Integrating these digital bioethical considerations into medical training demands a shift from passive knowledge transmission toward experiential, simulation-based learning. Scenario-driven modules involving mock privacy breaches, audit trail interpretation, and e-consent dialogues can help students grasp the real-world consequences of poor documentation practices and unsafe data handling. Likewise, structured opportunities to examine cases of algorithmic bias or misclassification within EMR-integrated decision tools can cultivate awareness of systemic inequities and promote more reflective clinical reasoning. These approaches are consistent with international innovations that emphasise hands-on digital competency

development and iterative feedback (Herrmann-Werner et al., 2021; Edmiston et al., 2021; Ramkumar et al., 2025).

Embedding digital ethics across the curriculum—rather than confining it to isolated lectures—promotes longitudinal reinforcement of safe and professional EMR use. Early exposure to simulated EMR environments, followed by advanced training in clinical years, enables students to practise documenting assessments, navigating patient records, and mitigating confidentiality risks before interacting with real patient data (Mollart et al., 2023; Hoonpongsimanont et al., 2019). This progression not only strengthens technical proficiency but also develops ethical fluency, making students more prepared to manage the ambiguous, high-stakes environments characteristic of digital healthcare.

However, in Indonesia, curricular reforms incorporating digital ethics remain limited. Existing programmes tend to address privacy and confidentiality at a conceptual level but do not integrate experiential learning or systematically assess students' digital professionalism. The absence of national standards or accreditation requirements further contributes to variability across institutions, leaving students unevenly prepared for EMR-centric clinical practice (Herlambang & Budiyanti, 2023; Izza & Lailiyah, 2024). As digitalisation accelerates, the need to embed digital bioethics into core medical competencies becomes increasingly urgent. Developing consistent national guidelines and aligning them with faculty development, simulation infrastructure, and assessment strategies would enable Indonesia to cultivate a digitally responsible medical workforce capable of navigating emerging ethical challenges in healthcare.

7. Quality and Comparative Analysis of Indonesian Studies

A closer examination of Indonesian scholarship reveals considerable variability in methodological rigour, conceptual depth, and practical relevance to EMR integration within medical education. Many local studies adopt narrative or descriptive designs, offering broad discussions of legal or ethical principles without systematically analysing how these frameworks apply to clinical training environments. For instance, Budiyanti et al. (2019) and Herlambang and Budiyanti (2023) highlight ethical and legal challenges surrounding EMRs but do not evaluate how these challenges should inform supervision structures, student access levels, or institutional liability management. Similarly, Larasati et al. (2024) assess confidentiality, integrity, and availability within EMR systems but stop short of linking these elements to operational protocols or educational strategies.

This contrasts with more empirically grounded analyses found in international literature, where studies frequently incorporate intervention-based or evaluative methodologies. For example, Herrmann-Werner et al. (2021), Hoonpongsimanont et al. (2019), and Mollart et al. (2023) employ pre–post or mixed-methods designs to assess the impact of EMR training interventions on documentation accuracy, confidence, and readiness for clinical practice. These findings provide actionable insights for curriculum development—insights largely absent from Indonesian publications, which seldom evaluate the outcomes of EMR-related training or propose measurable indicators of student competence.

In addition to methodological gaps, Indonesian studies often present inconsistent or contradictory interpretations of legal and ethical risks. While Budiyanti et al. (2019) emphasise the potential for privacy breaches and litigation, Indira and colleagues tend to focus on regulatory structures without fully addressing practical enforcement or the ethical tensions that arise in clinical education. Meanwhile, Izza and Lailiyah (2024) highlight infrastructural and workforce barriers yet omit considerations of how supervision protocols, tiered access systems, or digital professionalism training might mitigate these constraints.

When contrasted with international best practices, these gaps underscore a broader policy and research inertia. Global frameworks provide explicit guidance on student note verification, role-based access, audit trail usage, and structured digital ethics training—yet such specificity remains scarce in Indonesian discourse (Gliatto et al., 2009; Edmiston et al., 2021; Ramkumar et

al., 2025). The absence of national standards or accreditation-driven requirements further contributes to fragmented practices across teaching hospitals, exacerbating inconsistencies in student exposure, legal protections, and competence development.

Collectively, these findings demonstrate that Indonesian EMR scholarship remains in an early developmental stage, characterised by descriptive analyses rather than evaluative research or policy-driven inquiry. Strengthening the quality of local research will require more robust methodological approaches, interdisciplinary collaboration, and an explicit focus on operationalising ethical and legal principles into educational practice

CONCLUSION

This review demonstrates that although Indonesia has made significant regulatory progress through the issuance of Permenkes No. 24/2022, the integration of EMRs into medical education remains fragmented. Findings from the 22 included studies reveal persistent challenges: restrictive student access, inconsistent supervision, unclear documentation validity, and widespread ethical uncertainty (Heiman et al., 2014; Solarte & Könings, 2017; Welcher et al., 2018). These issues undermine student readiness and increase institutional risk. Broader literature indicates that structured EMR curricula, simulation platforms, and explicit national standards can bridge these gaps (Herrmann-Werner et al., 2021; Ramkumar et al., 2025; Edmiston et al., 2021).

To move forward, Indonesia must align its legal framework, ethical expectations, and educational strategies. National standards should clarify the scope of student documentation, supervision requirements, and verification mechanisms. Medical schools should embed digital professionalism and digital ethics longitudinally within curricula, supported by simulation-based EMR environments and supervised clinical practice. Hospitals should adopt tiered access systems, strengthen audit processes, and equip faculty to support safe documentation practices.

Future research should prioritise evaluative studies assessing the impact of EMR training interventions, digital ethics instruction, and supervision protocols on documentation quality, compliance, and learner outcomes. Interdisciplinary collaboration across law, health informatics, ethics, and medical education will be essential to drive evidence-based policy reform. By integrating legal clarity, ethical stewardship, and educational innovation, Indonesia can prepare a generation of physicians who are digitally competent, ethically grounded, and capable of practising safely within an evolving digital healthcare landscape.

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