GOLDEN RATIO OF LAW AND SOCIAL POLICY REVIEW
VOLUME 5, ISSUE. 1 (2025)
Website: https://goldenratio.id/index.php/grlspr

GOLDEN RATIO
ISSN [Online]: 2808-2923

LAW & SOCIAL POLICY | RESEARCH ARTICLE

Challenges and Prospects of Integrating Artificial Intelligence Technology in the Implementation of Law No. 17 of 2023 on Health: A Legal and Medical Practice Perspective

Sonia Ayu Islami[1], Rusmina Harisi[2], Ahmad Ma'mun Fikri[3]

[1,2,3] Department of Law, Faculty of Law, Universitas Islam Nusantara, Bandung. Indonesia.
Email: dr.soniaayuislami@gmail.com[1], rusminamars15@gmail.com[2], makmunfikri@yahoo.com[3]

ARTICLE HISTORY

Received: September 02, 2025
Revised: October 27, 2025
Accepted: October 28, 2025

DOI
https://doi.org/10.52970/grlspr.v5i1.1695

ABSTRACT
This study explores the challenges and prospects of integrating artificial intelligence (AI) technology into the implementation of Indonesia's Law No. 17 of 2023 on Health, from both legal and medical practice perspectives. Although the law represents a significant effort to modernize healthcare regulations in line with global developments, it has been criticized for being drafted hastily and for its lack of attention to emerging technologies such as AI. Similarly, Government Regulation (PP) No. 28 of 2024, which serves as an implementing regulation of Law No. 17 of 2023, provides little clarification regarding AI-related provisions. The study identifies several major challenges in AI adoption, including regulatory and legal constraints, technical and infrastructural limitations, and ethical and data privacy concerns. Conversely, the prospects of AI integration within the health sector include potential gains in efficiency and diagnostic accuracy, innovations in HealthCare delivery, and increased support from both governmental and private sectors. Furthermore, insights from legal practitioners and medical professionals are analyzed to present a holistic understanding of AI implementation in Indonesia's healthcare system. The findings suggest that AI holds substantial potential to transform Indonesia's healthcare sector; however, its success depends on the establishment of a specific, comprehensive, and adaptive regulatory framework. Accordingly, this study recommends the formulation of supportive policies and regulations, strategies to address existing barriers, and directions for future research on AI in healthcare.

Keywords: Artificial Intelligence, Health Sector, Legal Challenges, Implementation Prospects, Medical Ethics.

I. Introduction

Law No. 17 of 2023 concerning Health represents a significant milestone in the reform of Indonesia's healthcare system (Kesuma, 2024). In the digital era, artificial intelligence (AI) has demonstrated remarkable potential to enhance the efficiency and quality of medical services, ranging from improving diagnostic accuracy to enabling personalized treatment (Rajpurkar et al., 2022). According to Indonesia's National Strategy for Artificial Intelligence, the healthcare sector is identified as one of the top priorities for AI implementation. However, this technological advancement also brings complex legal and ethical challenges, particularly concerning the legal status of AI. The debate centers on whether AI should be regarded as a legal

ISSN [Online]: 2808-2923

subject, possessing certain rights and obligations (Amboro, 2021; Ravizki & Yudhantaka, 2022), or merely as a legal object—a tool utilized by humans or legal entities (Haris & Tantimin, 2022). This distinction has significant implications for the governance, accountability, and regulation of AI systems (Djanggih, 2021). Furthermore, the adoption of AI in healthcare raises critical issues regarding personal data protection, ethical standards, and legal liability (Diaz et al., 2023). Addressing these challenges is essential to ensure that AI contributes to equitable, transparent, and responsible healthcare practices. This research aims to fill an existing gap in the literature by providing a comprehensive analysis of the challenges and prospects of AI integration in the implementation of Law No. 17 of 2023. The study focuses on three key areas:

a. Legal and medical issues arising from the use of AI, including algorithmic bias and privacy violations;
b. The potential of AI to enhance diagnostic accuracy and healthcare service efficiency; and
c. Practical recommendations for developing an ethical, effective, and patient-centered regulatory framework.

II. Literature Review and Hypothesis Development

2.1. Definition and Basic Concepts of AI

Artificial Intelligence (AI) is a branch of computer science that develops systems capable of performing tasks that require human intelligence, such as machine learning, deep learning, natural language processing (NLP), and computer vision (Wachsmuth, 2000). Machine learning enables systems to learn from data without explicit programming (Hajari, 2021). In the healthcare sector, AI is utilized for medical data analysis, diagnostic algorithms, and clinical decision support (Johnson, 2021).

2.2. Global Applications of AI in Healthcare

Globally, AI has been widely applied in disease diagnosis, drug discovery, and patient management. AI algorithms demonstrate high accuracy in detecting cancer through radiology (Bera et al., 2022), identifying drug targets from genetic data (Qureshi et al., 2023; Vora et al., 2023), and improving the efficiency of hospital management systems (Khan et al., 2021; Talati, 2023). Moreover, AI plays an essential role in supporting telemedicine and preventing fraud in health insurance programs (Iqbal et al., 2022). Several countries have successfully implemented AI in healthcare systems. In the United States, the Mayo Clinic integrates AI to predict patient outcomes based on historical data (Zhang et al., 2022). The United Kingdom's National Health Service (NHS) employs AI to forecast medical needs (Horgan et al., 2020), while China applies AI for outbreak management by integrating multisource data (Dong et al., 2021). These global experiences demonstrate that AI can enhance healthcare quality, though they also highlight ethical and legal challenges related to data protection and algorithm transparency (Panch et al., 2018; WHO, 2021).

2.3. Development and Impact of Law No. 17 of 2023 on Health Regulation

Law No. 17 of 2023 was enacted to harmonize Indonesia's health regulations with global advancements (Kesuma, 2023; Dwiastuti, 2022). However, the drafting process was considered rushed and lacked adequate participation from professional organizations (Wegni et al., 2024; Amelia et al., 2023). One notable shortcoming is the absence of explicit provisions regarding AI technology. The law aims to strengthen Indonesia's health system by regulating access to healthcare services, human resources, technology, and the rights and obligations of both patients and medical professionals. AI-related provisions are only briefly mentioned in Government Regulation No. 28 of 2024, which forms part of the National Health Information System. Although the law does not directly regulate AI, it establishes a foundation for improving service

ISSN [Online]: 2808-2923

quality and developing healthcare worker competencies. Future challenges include infrastructure readiness, human resource training, and the formulation of more comprehensive AI policies (Kharisma, 2018).

2.4. International Legal Framework

At the international level, several legal frameworks have been developed to regulate the ethical and safe use of AI. The European Union has proposed a risk-based approach to AI regulation (Burri, 2022), while the United States—through the National Institute of Standards and Technology (NIST)—has issued guidelines promoting trustworthy and ethical AI development (Lunati, 2023). Moreover, international organizations such as UNESCO and the OECD emphasize the principles of transparency, accountability, fairness, and respect for human rights in AI governance (Galvão, 2023).

2.5. National AI Policy and Regulatory Framework in Indonesia

Indonesia's AI policy remains in its early stages of development. The National Artificial Intelligence Strategy 2020–2045 outlines a long-term plan to integrate AI across multiple sectors, including healthcare. However, the implementation of this strategy faces several obstacles, particularly concerning data security, ethical standards, and legal certainty. The Personal Data Protection (PDP) Law provides a partial legal basis for data governance but does not yet comprehensively regulate AI-specific issues, such as algorithmic accountability and system transparency.

2.6. Ethics of AI Use in Healthcare

The application of AI in healthcare raises significant ethical concerns. These include data privacy, algorithmic bias, and transparency in clinical decision-making (Zhang et al., 2021; Ntoutsi et al., 2020; Stower, 2020). AI technology should support rather than replace healthcare professionals (Karches, 2020), while preserving patient autonomy and ensuring that medical decisions remain under human supervision (Laitinen & Sahlgren, 2021). Ethical implementation of AI also demands adherence to fairness, accountability, and explainability principles to build trust between technology providers and healthcare recipients.

2.7. Legal Status and Implications of AI in Healthcare

The legal status of AI has become a critical issue in modern jurisprudence. Some scholars argue that AI could eventually be recognized as a legal subject, possessing certain rights and responsibilities (Amboro & Komarhana, 2021). However, most legal systems still classify AI as a legal object—a tool operated and controlled by humans or legal entities (Haris & Tantimin, 2022). Determining liability for AI-related errors in medical practice remains a complex issue (Doshi-Velez, 2017). The legal recognition of AI affects three key dimensions:

a. Regulation and Compliance – determining whether AI systems are subject to existing legal and ethical standards;
b. Liability – identifying the responsible party for any harm caused by AI decisions; and
c. Rights and Obligations – assessing whether AI or its operators hold specific legal duties or entitlements (Thessaloniki, 2023).

III. Research Method

This study employs a qualitative research approach. The collection of information and supporting data, including both primary and secondary legal sources (Tian, 2021), was conducted through an extensive

ISSN [Online]: 2808-2923

literature review using databases such as Google Scholar, PubMed, and Scopus. The search utilized the following keywords: "law," "ethics," "artificial intelligence," "health," and "medical." In addition, data were obtained from official sources, including the websites of the Ministry of Health of the Republic of Indonesia, the Indonesian Medical Association (IDI), the World Health Organization (WHO), the Laws of the Republic of Indonesia, and the Indonesian Code of Medical Ethics. The journals, articles, and legal documents referenced in this study primarily consist of recent research and publications issued between 2020 and August 2025. The analysis employed a qualitative analytical method to examine, interpret, and synthesize findings derived from the reviewed literature.

IV. Results and Discussion

4.1. The Challenges of AI Inclusion

a. Regulations and Laws

The implementation of artificial intelligence (AI) in Indonesia's healthcare sector faces significant regulatory challenges, primarily due to the absence of a comprehensive legal framework. Law No. 17 of 2023 does not contain specific provisions governing AI, although Government Regulation No. 28 of 2024 begins to provide regulatory space for its development. The Personal Data Protection Law offers a legal foundation for secure AI-driven data processing; however, existing cybersecurity regulations remain insufficient to address the rapid pace of technological advancement (Rahardjo, 2018; Azmi, 2020). Legal uncertainty also creates concerns among healthcare providers regarding potential liability in cases where AI contributes to misdiagnosis or improper treatment (Yusriadi, 2018). The most effective solution lies in the establishment of adaptive regulations through collaboration among the government, practitioners, and technology developers, as well as the creation of a specialized regulatory body dedicated to healthcare-related AI oversight.

b. Infrastructure and Technical Issues

Infrastructure-related challenges include limited internet connectivity, inadequate hardware and software capabilities, and poor integration with hospital information systems (Subroto et al., 2023; Mohammad & Maulidiyah, 2023). The quality of health data also presents a significant barrier, as data recording remains largely manual and lacks standardization (Riyanti, 2023; Lehne et al., 2019). Joint investments between the government and private sector are necessary to strengthen IT infrastructure, enhance data interoperability, and build human resource capacity. The Minister of Health Regulation No. 24 of 2022 concerning electronic medical records represents an initial step toward establishing a data-driven healthcare ecosystem that supports AI implementation.

c. Data Ethics and Privacy

Ethical concerns surrounding AI include algorithmic bias (Parra et al., 2021) and challenges in ensuring informed consent (Park, 2024; Cohen, 2019). Despite the enactment of the Personal Data Protection (PDP) Law, medical data privacy remains highly vulnerable due to limited enforcement (Khalid et al., 2023; Meher et al., 2023). To address these issues, solutions include promoting algorithmic transparency, strengthening data protection mechanisms, and providing education for both healthcare professionals and patients. Furthermore, the Ethics Commission—mandated under the 2019 National Science and Technology System Law—should be actively engaged to ensure that AI development aligns with ethical and responsible practices.

d. Risk of Health Worker Replacement

Concerns have emerged regarding potential job displacement, as AI technologies are increasingly capable of performing tasks such as diagnosis and patient screening (Elmahdy & Sebro, 2023; Gadde & Kalli,

ISSN [Online]: 2808-2923

2020). However, AI should be viewed as a supportive tool rather than a replacement for human healthcare workers (Montemayor et al., 2022; Lee & Yoon, 2021). Continuous training and reskilling programs are essential to help healthcare professionals adapt to technological changes. Additionally, cross-disciplinary collaboration opens new employment opportunities in AI system development, supervision, and ethical governance (Bhatt & Bae, 2023; Tursunbayeva & Renkema, 2023).

4.2. AI Inclusion Prospects

a. Benefits and Efficiency

Artificial intelligence (AI) has the potential to enhance diagnostic accuracy (Wani et al., 2022), improve hospital management efficiency (Trivedi & Patel, 2020), and support the advancement of personalized medicine (Álvarez-Machancoses & Fernández-Martínez, 2019; Nayarisseri, 2021). In the Indonesian context, AI can also help bridge healthcare disparities through the expansion of telemedicine services (Pacis et al., 2018).

b. Innovation and Quality Improvement

AI continues to drive innovation in various aspects of healthcare, including image-based medical diagnosis (Mun et al., 2021), personalized medicine (Khanna et al., 2022), and data-driven clinical decision-making (Scerri & Grech, 2020). Furthermore, AI facilitates healthcare service delivery in remote areas (Mondal et al., 2023) and accelerates the pace of medical research and development.

c. Government and Private Sector Support

Strong synergy between the government and the private sector is essential to advance AI implementation in healthcare. This collaboration should focus on developing conducive regulations, strengthening infrastructure, enhancing medical personnel training, and providing innovation incentives. Such cooperation can be realized through pilot projects, public–private partnerships, and strategic investments in AI-based healthcare technologies.

4.3. Legal Perspectives and Medical Practice

a. Legal Practitioners

Legal scholars emphasize the urgent need for specific regulations addressing ethical standards, accountability, and legal responsibilities related to AI in healthcare (Hutauruk, 2024; Herwanto et al., 2023). They also highlight the importance of oversight mechanisms and continuous legal education for medical professionals to ensure lawful and ethical AI application (Zebua et al., 2023).

b. Medical Professionals

Healthcare practitioners recognize the potential benefits of AI but underscore the importance of clinical validation, data security, and adequate training. They emphasize that clinical decision-making must remain under human control to preserve the integrity of the doctor–patient relationship (Santhi & Damayanti, 2024; Raharjo, 2023).

c. Successful Case Studies

Several international case studies demonstrate the successful integration of AI into healthcare systems. Examples include DeepMind's application in eye disease diagnosis in the United Kingdom (Franzco & Franzco, 2022), IBM Watson for oncology treatment planning (Lee & Kim, 2016), BlueDot's use in pandemic prediction (Allam et al., 2020), and the deployment of AI robotics to assist the elderly in Japan (Cho, 2024). In Indonesia, several hospitals have also begun exploring the adoption of AI-based technologies in clinical and administrative settings.

ISSN [Online]: 2808-2923

V. Conclusion

To effectively address the challenges associated with the implementation of artificial intelligence (AI) technology in Indonesia's healthcare sector, several strategic measures must be undertaken. The first step is to develop a clearer and more comprehensive regulatory framework that encompasses legal liability, data privacy, and ethical standards in AI utilization. Such regulations should aim to reduce legal ambiguity and provide explicit guidance on the rights and obligations of all relevant stakeholders. The Health Law and its derivative regulations must include a more detailed delineation of AI applications in healthcare. Furthermore, Indonesia could consider formulating a dedicated legal framework that governs AI both as a subject and as an object of law. In addition to regulatory reform, investment in technological infrastructure is imperative. Collaboration between the government and the private sector is essential to enhance internet connectivity, establish secure and reliable data centers, and equip hospitals and healthcare facilities with adequate technological tools for AI implementation. The improvement of medical data quality and capacity should also be prioritized, as AI systems rely heavily on accurate and standardized data to produce reliable outcomes. Equally important is the education and training of both medical and legal professionals. Comprehensive training programs must be designed to equip practitioners with the necessary skills to operate AI systems, interpret AI-generated results, and understand the associated legal and ethical implications. These initiatives will help ensure that professionals can integrate AI effectively, responsibly, and ethically into medical practice.

From a policy perspective, the government should adopt proactive measures to encourage AI innovation in healthcare. Establishing a dedicated regulatory body for healthcare AI could play a pivotal role in supervising implementation, conducting regular audits, and ensuring compliance with existing regulations. This institution could also serve as a central authority for resolving disputes and addressing issues arising from the use of AI in medical contexts. In addition, incentives such as tax reductions, subsidies, or research grants should be introduced to promote AI adoption among hospitals and healthcare providers. Recognizing and rewarding healthcare institutions that successfully implement AI technologies may further stimulate innovation and broader adoption. At the same time, robust data protection mechanisms must be reinforced to safeguard patient privacy. Updated regulations on the collection, storage, and utilization of medical data are crucial to prevent misuse and ensure data security within AI-based healthcare systems. Hospitals should also establish clear Standard Operating Procedures (SOPs) governing the use of AI in diagnosis and treatment. These SOPs must clearly define operational boundaries, ensuring that AI functions as an assistive tool rather than a replacement for professional medical judgment. Every output generated by AI should be validated and interpreted by qualified healthcare practitioners before being applied in patient care. SOPs must also include explicit provisions on legal liability in cases of diagnostic or therapeutic errors involving AI, clearly defining accountability and responsibility. Such internal policies are essential to protect patient rights and to ensure that ultimate decision-making authority remains with human professionals.

Finally, further research is critical to continuously strengthen AI integration and assess its long-term impact on healthcare. Longitudinal studies are valuable for evaluating AI's effects on clinical outcomes and operational efficiency. More comprehensive research on the ethical and legal dimensions of AI use is also needed to identify potential risks and design effective mitigation strategies. Comparative studies of international best practices can offer valuable insights that may be adapted to Indonesia's healthcare context. Collaborative efforts among researchers, technology developers, and medical practitioners are key to fostering innovation while ensuring responsible AI use. By implementing these strategic measures, Indonesia can overcome existing challenges and fully harness the transformative potential of artificial intelligence to improve the quality, efficiency, and accessibility of healthcare services nationwide.

References

Allam, Z., Dey, G., & Jones, D. S. (2020). Artificial intelligence (AI) provided early detection of the coronavirus (COVID-19) in China and will influence future urban health policy internationally. *AI, 1*(2), 156–165.

ISSN [Online]: 2808-2923

Álvarez-Machancoses, Ó., & Fernández-Martínez, J. L. (2019). Using artificial intelligence methods to speed up drug discovery. *Expert Opinion on Drug Discovery, 14*(8), 769–777.

Amboro, F. L., & Komarhana, K. (2021). Prospects for artificial intelligence as a subject of civil law in Indonesia. *Law Review, 21*(2), 145–172.

Amelia, D. A., Kusumo, A. K. L., & Kanssa, D. A. (2023). Participation and relations between CSOs and political parties in public policy (Case study of the Indonesian Doctors Association (IDI) and the Indonesian Democratic Party of Struggle (PDIP) in the Health Bill). *JIIP – Journal of Educational Sciences, 6*(11), 9025–9029.

Azmi, R. H. N. (2020). Indonesian cyber law formulation in the development of national laws in the 4.0 era. *Lex Scientia Law Review, 4*(1), 46–58.

Benhans, D., Ningsih, V. F., Jong, R., Febrianto, F., Evander, O., Wijaya, G., & Aripradono, H. W. (2023). Health disorder detection through voice analysis: Detecting abnormal breathing symptoms and unhealthy heart sounds using artificial intelligence. *Journal of Information Systems and Technology (JOINT), 4*(3), 435–438.

Bera, K., Braman, N., Gupta, A., Velcheti, V., & Madabhushi, A. (2022). Predicting cancer outcomes with radiomics and artificial intelligence in radiology. *Nature Reviews Clinical Oncology, 19*(2), 132–146.

Bhatt, A. B., & Bae, J. (2023). Collaborative intelligence to catalyze the digital transformation of healthcare. *NPJ Digital Medicine, 6*(1), 177.

Burri, S. R., Kumar, A., Baliyan, A., & Kumar, T. A. (2023, April). Predictive intelligence for healthcare outcomes: An AI architecture overview. In *2023 2nd International Conference on Smart Technologies and Systems for Next Generation Computing (ICSTSN)* (pp. 1–6). IEEE.

Burri, T. (2022). *The new regulation of the European Union on artificial intelligence.*

Chatterjee, P., Tesis, A., Cymberknop, L. J., & Armentano, R. L. (2020). Internet of things and artificial intelligence in healthcare during the COVID-19 pandemic—A South American perspective. *Frontiers in Public Health, 8*, 600213.

Cho, W. (2024). Elderly care AI robot: Korea and Japan cases and prospects. *Studies on Humanities and Social Sciences (SHSC), 6*(1), 855–866.

Cohen, I. G. (2019). Informed consent and medical artificial intelligence: What to tell the patient? *Georgetown Law Journal, 108*, 1425.

Dey, D., Slomka, P. J., Leeson, P., Comaniciu, D., Shrestha, S., Sengupta, P. P., & Marwick, T. H. (2019). Artificial intelligence in cardiovascular imaging: JACC state-of-the-art review. *Journal of the American College of Cardiology, 73*(11), 1317–1335.

Díaz-Rodríguez, N., Del Ser, J., Coeckelbergh, M., de Prado, M. L., Herrera-Viedma, E., & Herrera, F. (2023). Connecting the dots in trustworthy artificial intelligence: From AI principles, ethics, and key requirements to responsible AI systems and regulation. *Information Fusion, 99*, 101896.

Djanggih, H. (2021). The urgency of designing legislation for the use of artificial intelligence in Indonesian medical practice. *Jurnal Penelitian Hukum De Jure, 21*(4), 541–549.

Dong, J., Wu, H., Zhou, D., Li, K., Zhang, Y., Ji, H., ... & Liu, Z. (2021). Application of big data and artificial intelligence in COVID-19 prevention, diagnosis, treatment, and management decisions in China. *Journal of Medical Systems, 45*(9), 84.

Doshi-Velez, F., Kortz, M., Budish, R., Bavitz, C., Gershman, S., O'Brien, D., ... & Wood, A. (2017). Accountability of AI under the law: The role of explanation. *arXiv preprint* arXiv:1711.01134.

Dwiastuti, I., Raharyo, A., Farid, M., & Baskoro, R. (2022). Indonesia's commitment to the implementation of SDG 5 to guarantee human security, especially for women (2015–2021). *Verity: International Relations Journal, 14*(27), 1–17.

Elmahdy, M., & Sebro, R. (2023). A snapshot of artificial intelligence research 2019–2021: Is it replacing or assisting physicians? *Journal of the American Medical Informatics Association, 30*(9), 1552–1557.

FRANZCO, S. K. P., & FRANZCO, P. V. W. P. (n.d.). The eye in AI: Artificial intelligence in ophthalmology.

ISSN [Online]: 2808-2923

Gadde, S. S., & Kalli, V. D. R. (2020). Applications of artificial intelligence in medical devices and healthcare. *International Journal of Computer Science Trends and Technology, 8*, 182–188.

Galvão, C. A. T. (2023). OECD's and UNESCO's recommendations on artificial intelligence in the 2020s: Exploring approaches in the context of multilateralism and the world order.

Hajari, M. (2021). Machine learning in artificial intelligence: Towards a common understanding.

Han, J. E. D., Liu, X., Bunce, C., Douiri, A., Vale, L., Blandford, A., ... & Balaskas, K. (2022). Teleophthalmology-enabled and artificial intelligence-ready referral pathway for community optometry referrals of retinal disease (HERMES): A cluster randomized superiority trial with a linked diagnostic accuracy study—HERMES study report 1—study protocol. *BMJ Open, 12*(2), e055845.

Haris, M. T. A. R., & Tantimin, T. (2022). Analysis of criminal legal responsibility for the use of artificial intelligence in Indonesia. *Journal of Legal Communication (JKH), 8*(1), 307–316.

Herwantono, H., Hasibuan, K., & Judijanto, L. (2023). The influence of the Industrial Revolution 4.0 on the legal system and technology use policy in Indonesia. *Wara Sains Journal of Law and Human Rights, 2*(10), 973–982.

Horgan, D., Romao, M., Morré, S. A., & Kalra, D. (2020). Artificial intelligence: Power for civilization—and for better healthcare. *Public Health Genomics, 22*(5–6), 145–161.

Hutauruk, R. (2024). *Legal protection for the use of artificial intelligence/AI in the creation of songs/music* [Doctoral dissertation, Pelita Harapan University].

Iqbal, M. S., Abd-Alrazaq, A., & Househ, M. (2022). Artificial intelligence solutions to detect fraud in healthcare settings: A scoping review. *Advances in Informatics, Management and Technology in Healthcare,* 20–23.

Jia, Z., Chen, J., Xu, X., Kheir, J., Hu, J., Xiao, H., ... & Shi, Y. (2023). The importance of resource awareness in artificial intelligence for healthcare. *Nature Machine Intelligence, 5*(7), 687–698.

Johnson, K. B., Wei, W. Q., Weeraratne, D., Frisse, M. E., Misulis, K., Rhee, K., ... & Snowdon, J. L. (2021). Precision medicine, AI, and the future of personalized health care. *Clinical and Translational Science, 14*(1), 86–93.

Karches, K. E. (2018). Against the iDoctor: Why artificial intelligence should not replace physician judgment. *Theoretical Medicine and Bioethics, 39*(2), 91–110.

Kesuma, S. I. (2024). Review of Law No. 17 of 2023 concerning health. *Nusantara Berbakti Journal, 2*(1), 253–261.

Khalid, N., Qayyum, A., Bilal, M., Al-Fuqaha, A., & Qadir, J. (2023). Privacy-preserving artificial intelligence in healthcare: Techniques and applications. *Computers in Biology and Medicine, 158*, 106848.

Khan, S., Tsutsumi, S., Yairi, T., & Nakasuka, S. (2021). Robustness of AI-based prognostic and systems health management. *Annual Reviews in Control, 51*, 130–152.

Khan, Z. F., & Alotaibi, S. R. (2020). Applications of artificial intelligence and big data analytics in m-health: A healthcare system perspective. *Journal of Healthcare Engineering, 2020*(1), 8894694.

Khanna, N. N., Maindarkar, M. A., Viswanathan, V., Fernandes, J. F. E., Paul, S., Bhagawati, M., ... & Suri, J. S. (2022, December). Economics of artificial intelligence in healthcare: Diagnosis vs. treatment. In *Healthcare* (Vol. 10, No. 12, p. 2493). MDPI.

Kharisma, D. B. (2018). Regional health system: Issues and challenges in the health sector in Indonesia. *Rechtvinding Online Journal.*

Komalasari, R. (2022). Utilization of artificial intelligence (AI) in telemedicine: From a health professional's perspective. *Mulawarman Medical Journal, 9*(2), 72–81.

Laitinen, A., & Sahlgren, O. (2021). AI systems and respect for human autonomy. *Frontiers in Artificial Intelligence, 4*, 705164.

Lee, D., & Yoon, S. N. (2021). Application of artificial intelligence-based technologies in the healthcare industry: Opportunities and challenges. *International Journal of Environmental Research and Public Health, 18*(1), 271.

ISSN [Online]: 2808-2923

Lee, K. Y., & Kim, J. (2016). Artificial intelligence technology trends and IBM Watson references in the medical field. *Korean Medical Education Review, 18*(2), 51–57.

Lehne, M., Sass, J., Essenwanger, A., Schepers, J., & Thun, S. (2019). Why digital medicine depends on interoperability. *NPJ Digital Medicine, 2*(1), 79.

Li, R., Zhao, Z., Zhou, X., Ding, G., Chen, Y., Wang, Z., & Zhang, H. (2017). Intelligent 5G: When cellular networks meet artificial intelligence. *IEEE Wireless Communications, 24*(5), 175–183.

Lunati, M. (2023). *The transformative integration of artificial intelligence with CMMC and NIST 800-171 for advanced risk management and compliance.*

Mahammad, A. B., & Kumar, R. (2023, April). A scalable and secure framework to secure and maintain healthcare data using blockchain technology. In *2023 International Conference on Computational Intelligence and Sustainable Engineering Solutions (CISES)* (pp. 417–423). IEEE.

Meher, C., Sidi, R., & Risdawati, I. (2023). Use of personal health data in the big data era: Legal and policy challenges in Indonesia. *Journal Ners, 7*(2), 864–870.

Mohammad, W., & Maulidiyah, N. R. (2023). The influence of internet access on aspects of the quality of life of Indonesian society. *Triwikrama: Journal of Social Sciences, 1*(2), 211–221.

Mondal, H., Mondal, S., & Singla, R. K. (2023). Artificial intelligence in rural health in developing countries. In *Artificial Intelligence in Medical Virology* (pp. 37–48). Springer Nature Singapore.

Montemayor, C., Halpern, J., & Fairweather, A. (2022). In principle, obstacles for empathic AI: Why we can't replace human empathy in healthcare. *AI & Society, 37*(4), 1353–1359.

Mun, S. K., Wong, K. H., Lo, S. C. B., Li, Y., & Bayarsaikhan, S. (2021). Artificial intelligence for the future radiology diagnostic service. *Frontiers in Molecular Biosciences, 7*, 614258.

Nagarajan, N., Yapp, E. K., Le, N. Q. K., Kamaraj, B., Al-Subaie, A. M., & Yeh, H. Y. (2019). Application of computational biology and artificial intelligence technologies in cancer precision drug discovery. *BioMed Research International, 2019*(1), 8427042.

Nayarisseri, A., Khandelwal, R., Tanwar, P., Madhavi, M., Sharma, D., Thakur, G., ... & Singh, S. K. (2021). Artificial intelligence, big data, and machine learning approaches in precision medicine and drug discovery. *Current Drug Targets, 22*(6), 631–655.

Ntoutsi, E., Fafalios, P., Gadiraju, U., Iosifidis, V., Nejdl, W., Vidal, M. E., ... & Staab, S. (2020). Bias in data-driven artificial intelligence systems—An introductory survey. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, 10*(3), e1356.

OBAACHAN'S, A. I. (2023). Chapter six: OBAACHAN'S AI—How Japanese technology leads the West for geriatric care. In *Cross-Cultural Influences between Japanese and American Pop Cultures: Powers of Pop* (p. 162).

Oktavia, D. H., & Suseno, G. (2024). Utilization of artificial intelligence in education in Indonesia: Potential and challenges. *Indo-MathEdu Intellectuals Journal, 5*(2), 1680–1686.

Pacis, D. M. M., Subido, E. D., & Bugtai, N. T. (2018, February). Trends in telemedicine using artificial intelligence. In *AIP Conference Proceedings* (Vol. 1933, No. 1). AIP Publishing.

Panch, T., Szolovits, P., & Atun, R. (2018). Artificial intelligence, machine learning, and health systems. *Journal of Global Health, 8*(2).

Parikh, R. B., Teeple, S., & Navathe, A. S. (2019). Addressing bias in artificial intelligence in health care. *JAMA, 322*(24), 2377–2378.

Park, C. W., Seo, S. W., Kang, N., Ko, B., Choi, B. W., Park, C. M., ... & Yoon, H. J. (2020). Artificial intelligence in health care: Current applications and issues. *Journal of Korean Medical Science, 35*(42).

Park, H. J. (2024). Patient perspectives on informed consent for medical AI: A web-based experiment. *Digital Health, 10,* 20552076241247938.

Parra, C. M., Gupta, M., & Dennehy, D. (2021). Likelihood of questioning AI-based recommendations due to perceived racial/gender bias. *IEEE Transactions on Technology and Society, 3*(1), 41–45.

Pengkajian, B., & Teknologi, P. (2020). *Indonesia's national artificial intelligence strategy 2020–2045.* Agency for the Assessment and Application of Technology.

ISSN [Online]: 2808-2923

Petiwala, F. F., Shukla, V. K., & Vyas, S. (2021). IBM Watson: Redefining artificial intelligence through cognitive computing. In *Proceedings of International Conference on Machine Intelligence and Data Science Applications: MIDAS 2020* (pp. 173–185). Springer Singapore.

Prabhod, K. J. (2024). The role of artificial intelligence in reducing healthcare costs and improving operational efficiency. *Quarterly Journal of Emerging Technologies and Innovations, 9*(2), 47–59.

Putranti, D., & Anggraeny, K. D. (2022). Legal responsibility of inventors for artificial intelligence inventions in Indonesia. *Journal of Law & Development, 52*(3), 781–792.

Qureshi, R., Irfan, M., Gondal, T. M., Khan, S., Wu, J., Hadi, M. U., ... & Alam, T. (2023). AI in drug discovery and its clinical relevance. *Heliyon, 9*(7).

Rahardjo, B. (2018). The state of cybersecurity in Indonesia. In *Digital Indonesia* (pp. 1–15). ISEAS Publishing.

Raharjo, B. (2023). *Ethical theory in artificial intelligence (AI).* Prima Agus Teknik Foundation Publisher.

Wen, Z., & Huang, H. (2022). The potential for artificial intelligence in healthcare. *Journal of Commercial Biotechnology, 27*(4).

Wijonarko, P., Wagiman, W., Khana, R., Tundo, T., Salam, A., & James, B. (2023). Application and contribution of ChatGPT artificial intelligence to interpret legal texts (Case study of interpretation of Article 10, Article 13, Minister of Health Regulation No. 889 of 2011). *Journal of Electrical Engineering Studies, 8*(2), 37–44.

World Health Organization. (2021). *Ethics and governance of artificial intelligence for health: WHO guidance (Executive summary).* World Health Organization.

Wu, X., Zhu, X., Wu, G. Q., & Ding, W. (2013). Data mining with big data. *IEEE Transactions on Knowledge and Data Engineering, 26*(1), 97–107.

Yuliyana, R., & Daswito, R. (2023). Exploring the potential of ChatGPT in the role of healthcare professionals. *Journal of Integrated Health Science and Technology, 3*(2), 46–50.

Yunus, R. E., & Rad, S. (2020). Overview and rationale for the use of thoracic radiology in the diagnosis of COVID-19. In *Handling COVID-19: RSUI Experience* (p. 14).

Yusriadi, Y. (2018). Indonesian bureaucratic reform: Opportunities and obstacles. *Public Administration Journal, 8*(2), 178–185.

Zebua, R. S. Y., Khairunnisa, K., Hartatik, H., Pariyadi, P., Wahyuningtyas, D. P., Thantawi, A. M., ... & Kharisma, L. P. I. (2023). *The phenomenon of artificial intelligence (AI).* PT Sonpedia Publishing Indonesia.

Zhang, J., Budhdeo, S., William, W., Cerrato, P., Shuaib, H., Sood, H., ... & Teo, J. T. (2022). Moving towards vertically integrated artificial intelligence development. *NPJ Digital Medicine, 5*(1), 143.

Zhang, Y., Wu, M., Tian, G. Y., Zhang, G., & Lu, J. (2021). Ethics and privacy of artificial intelligence: Understandings from bibliometrics. *Knowledge-Based Systems, 222*, 106994.