AI Ethics Implementation In Indonesia Hospitals: Challenges Or Opportunities

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Abstract.

In the last five years, the technology adoption in Indonesia has begun to use advances in artificial intelligence (AI) ethics to improve healthcare services. This change has had a significant impact on several institutions, especially the hospital industry. This paper provides an overview of hospital institutions in Indonesia that are implementing AI ethics. AI ethics comprehensive review of 54 papers from the Scopus, PubMed and Google Scholar database was used to develop our methodology. The existing literatures, which includes studies from various disciplines such as education, healthcare, information communication technology (ICT), licensing, law, hospitality, and economic services, demonstrated the widespread implementation of AI in these fields. We have found potentiality benefit of AI implementation in Indonesian hospital which focusing on increasing patient outcomes and also equalizing of healthcare service. This output can be done with find out the strategy to maximizing its benefit and paralely to decrease and minimizing the rise of ethic risk. This review concludes that AI implementation in Indonesian Hospital come with significantly opportunity for increasing patient healthcare outcome and equality of healthcare services. We provide a new view for organizing governance research, that identifies gaps in the existing literature speciality in healthcare and suggests future directions, for research utilizing technology in AI ethics.

Keywords: *Ai Ethics; Artificial Intelligence; Ethics Healthcare and Hospital.*

I. INTRODUCTION

In various parts of the world, the use of artificial intelligence (AI) in hospitals is increasing and promises many benefits for the distribution of health services[1] However, the adoption of AI raises many questions and concerns[2] as well as ethical violations[3]. Adoption of AI in the healthcare industry is full of challenges, especially in adopting this technology, which requires seriousness in anticipation and planning[4]. A holistic review of the most recent academic discourse including from health practitioners is still needed even though research on AI ethics in hospitals has been carried out[5]. This is to support monitoring the implementation of AI Ethics in the future[6]. Furthermore, specifically for the context in Indonesia, an understanding of the challenges and practical opportunities is very important for the success of AI implementation.

Defining AI Ethics in Healthcare

Based on previous literature, a number of ethical principles and considerations relevant to the implementation of AI in healthcare have been performed[7]. Put simply, if we put these points together, then in the context of health, AI Ethics can be understood to be the framework[8] of principles and guidelines that rule the development, application, and use of AI technology in healthcare for responsible[9], safe, fair, and beneficial application to patients[10], healthcare workers, and society in general[3]. This paper answers the several ethical dimensions and challenges brought up by these unique capabilities in potentially exerting influence on how AI will be put to use within healthcare[11]. There are key principles of AI Ethics in Healthcare such as beneficience, non-maleficence[12], autonomy[13], justice and equity[14][12], explainability, transparancy[15], privacy and security[16], also accountability and responsibility[9][17].

Adhering to and implementing these principles is critical to ensuring that AI systems are developed and used ethically, safely and effectively in healthcare settings[18]. Implementing ethical principles and practices in healthcare is not easy and requires addressing several challenges and opportunities such as data bias[19], lack of transparency and clarity[20], privacy and data security issues, impact on healthcare professionals[7], [21], public trust and acceptance[17], [22]. While the existence of these challenges[23] from previous literature emphasizes the opportunities for AI to significantly improve healthcare delivery[24], by addressing these ethical considerations and developing a robust framework for responsible AI implementation, hospitals in Indonesia can leverage AI to improve patient care, increase efficiency, and contribute to a more just and equitable healthcare system[25]. Based on the previous studies and the conversation history, a contextualized benefits of AI in Indonesian Hospitals can become a research gap exist that can be addressed to this study. Many studies highlight the general benefits of AI in healthcare, but there is limited specific exploration of how these benefits might manifest in Indonesian hospitals[3], [9], [26], [27]. This research aims to provide support for these disparities or gaps in ethical considerations, especially related to the implementation of AI in Indonesian hospitals by exploring the questions: What are the potential benefits of AI implementation in Indonesian hospitals, particularly in terms of improving patient outcomes and healthcare equity, and how can these benefits be maximized while minimizing ethical risks?

Ethical Considerations for Maximizing Benefits

AI has big potential to revolutionize healthcare service in Indonesia, which can give a lot of benefit to patients, doctors, and comprehensive healthcare system. However, they consistently highlight that successfully open those potential is dependent on precise understanding to the AI ethics landscape in healthcare services environment[28]. AI consideration is not just an afterthought but basic requirements for maximize AI benefit and reduce risk potential[29]. They are various domains AI can dramatically enhance Indonesian healthcare such as improving accuracy and speed in diagnosis and treatment[30], boosting efficiency and resource optimization[31], expanding healthcare access[32], accelerating medical research[33]. Eventhough we are acknowledging AI's vast potential, previous studies consitently stress that realizing the benefits in Indonesian hospitals depends on addressing ethical consideration throughout the AI lifecycle[34]. This includes responsible development, deployment, and ongoing monitoring and evaluation of AI system. Detail discussion in previous studies speak about Patient Well-being and Autonomy at the Forefront[35], Protection of Patient Privacy and Data Security[36], Combating Algorithmic Bias[37] and Ensuring Fairness, Transparency and Explainability as Pillars of Trust[38], Data Governance and Cybersecurity: Protecting Patient Data.

Based on previous academic literature and insights from healthcare practitioners in Indonesia, synthesizing those resources in this SLR seeks to provide a comprehensive understanding of the ethical landscape surrounding the application of AI in Indonesian hospitals. This is expected to form the basis for the development of guidelines and recommendations that are appropriate to the Indonesian context, in order to ensure the responsible and beneficial use of AI in the context of healthcare.

II. METHODS

Our research approach is to apply a systematic literature review. This type of approach will utilize a way of evaluating and understanding all the scientific work that we find and that is related to a particular research question, topic, or recent phenomenon[39]. We use the PRISMA guidelines as a guide in carrying out this research process so that we can have output in the form of accurate knowledge realization[40]. We carried out the research stages in this method using several steps, such as search process, inclusion and exclusion criteria, and data extraction[41] with criteria tailored to a particular topic, utilizing academic indexing databases, adding a new database if the specific search key did not find the specific criteria we determined, assessing the quality of each document, and more accurate content checking manually.

Search Process

A literature review search was processed in the following three academic database: Scopus, PubMed and Google Scholar. Initially, we used a keyword: ((AI OR artificial intelligence) AND (challenge OR opportunity) AND (healthcare OR hospital) AND Indonesia). Results from the academic databases of

Scopus, PubMed, and ACM were searched but did not produce any results at all. So we deleted the keyword 'Indonesia', then did a literature search in the three academic databases, and acquired the number of literatures according to Figure 1. Until the last stage, the ACM output could not be processed because there was no relevance to our research topic. To complete the literature providing the context of AI implementation in Indonesia, we tried to use Google Scholar with the initial keyword and obtained the relevance of the paper according to the table.

No.	Academic Database	Keyword	Result
1	Scopus	TITLE-ABS-KEY ((artificial AND intelligence) OR (ai) AND ethics AND (challenge OR opportunity) AND hospital) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (OA , "all"))	14
2	Pubmed	((artificial AND intelligence) OR ai AND ethics AND (hospital OR hospitals OR healthcare) AND (challenges OR opportunity))	34
3	Google Scholar	((artificial AND intelligence) OR (ai) AND ethics AND (challenge OR opportunity) AND hospital) AND Indonesia))	4

Fig 1. Academic Databases, Keywords and Results

Inclusion and exclusion criteria

The eligibility criteria are specified as inclusion and exclusion criteria in Figure 2. We stipulated that the selected documents had to be aligned with the inclusion and exclusion criteria to fit the scope of our research. Since the keywords are utilized in academic databases, the related papers are referred to as ‘discovered studies. After the papers are read based on the relevance of the title, abstract and content of the paper to our research topic, we download the papers.If the title is not enough to determine whether to include the paper as a candidate, the abstract is then read. If the title and abstract match the previously set research question, then the paper will be downloaded for further observation. The papers that have been successfully downloaded are referred to as ‘candidate studies’. All ‘candidate studies’ are read thoroughly to find answers to the research questions. These papers are the ones that will be used in the study as ‘selected studies’. Papers are excluded based on the publication date (before 2020), discussions that are out of context of our research topic such as the phrases ‘ethics’, ‘ethically’, ‘AI’, Artificial Intelligence, ‘challenges’, ‘opportunity’, ‘healthcare’ or ‘hospital’. This is done so that we can gain new knowledge and information from previous research and can obtain quality literature from trusted sources. Duplicate papers from the same study are also excluded in the SLR. This SLR has limitations because it focuses on the study of AI Ethics applied in Indonesian hospitals.

No.	Inclusion	No.	Exclusion
1	Published between 2020 – 2024	1	Did not focus on AI Ethics
2	Mention Ethics, AI, Artificial Intelligence, Challenges, Opportunity, Healthcare or Hospital	2	Did not mention word ‘Ethics’
3	Publication stage is final	3	Did not have DOI
4	Document type is Article	4	Only focus on AI Technology
5	Written in English		

Fig 2. Inclusion and exclusion criteria (documents published between 2022-2024)

Data extraction

This study began in November 2024 and examined 11,125 papers. The page numbers per source are summarized in Figure 3. Among the 11,125 papers, there were 3 duplicated papers and 11,122 that had titles and abstracts related to the research question. However, after further examination, only 144 papers could be included in this research as 'candidate studies'. After going through a more in-depth literature review research, there were 52 papers as papers with the label 'selected studies'.

No.	Academic Database	Studies found	Candidate studies	Selected studies
1	Scopus	8263	33	14
2	PubMed	1949	69	34
3	Google Scholar	864	13	4

Fig 3. Number studies in selected sources

PRISMA diagram

The PRISMA flow diagram (Figure 4) presents a visual representation of the study selection process. It illustrates the number of records identified, screened, included, and excluded at each stage of the review. As shown in Figure 4, a total of 54 studies met the inclusion criteria and were included in the final analysis.

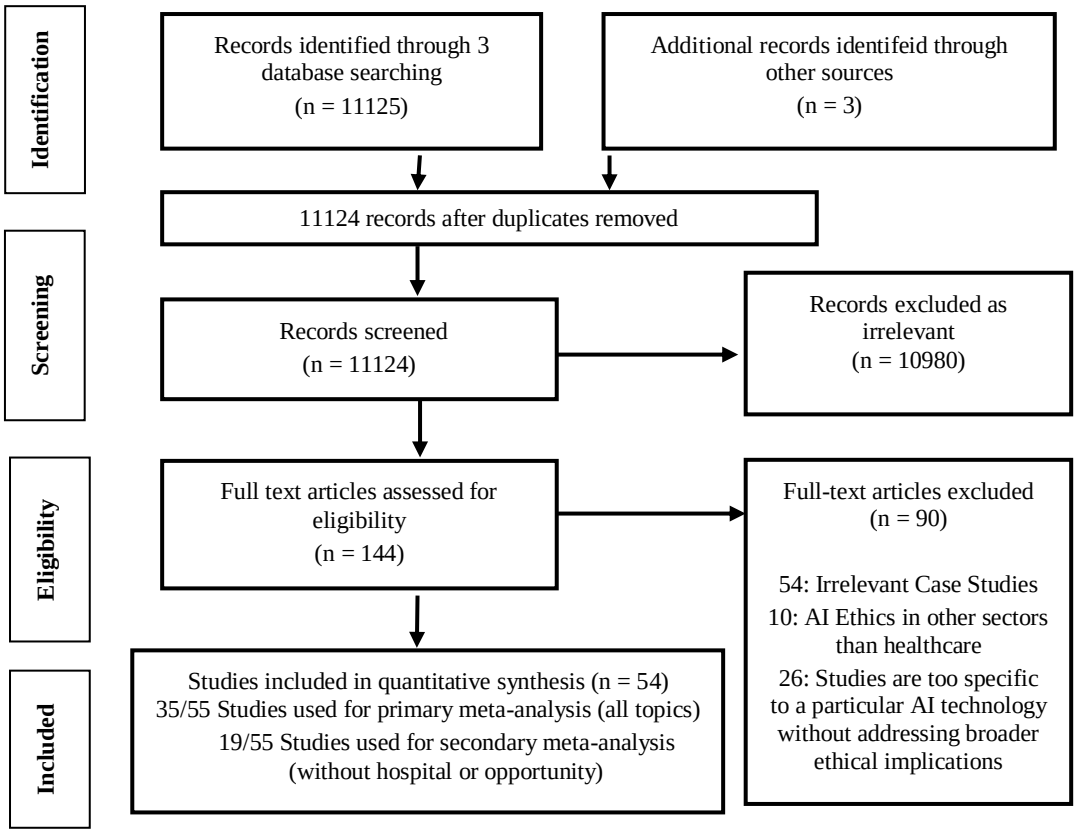

Fig 4. PRISMA flow diagram

III. RESULT AND DISCUSSION

Based on previous studies, we have found potentiality benefit of AI implementation in Indonesian hospital which focusing on increasing patient outcomes and also equalizing of healthcare service. This output can be done with find out the strategy to maximizing its benefit and paralely to decrease and minimizing the rise of ethic risk.The particular literature consistently highlights the potential of AI to increase patient outcome significantly in various medical speciality. This matter found based on the capability of AI to increasing accuracy of diagnostic, especialy deep learning which show extraordinary accurate to interpretant medical images and other type of diagnostics. In example, a study highlighted[42]. showed that AI successfully achieved high accuracy in identifying tumor-damaged tissue in histopathological images. Another example AI capability is potentially leading to faster and more acurate detecting of diseases[43][44][45], [46]. AI also has its capability to personalize healthcare planning as AI can analyzing large data of patients including medical records, genetic information, and lifestyle factor for developing personalize healthcare planning[14]. Personalizing approach can be optimized the effectiveness of healthcare services with reducing side effects. This study[47] discuss how AI can help determine optimal treatment and dosage based on individual patient factors. Another study how AI improving treatment outcomes[45] and managing chronic condition such as heart failure, allowing for more targeted intervention and potentially reducing hospital readmission[44]. AI also can identify patient which has risk in particular condition or has complication. This predictive capability potentially to intervention in early management to solve any healthcare problems to improve outcomes[48].

The study mentions how AI use in neonatology for predicting complications[49]. While lots of literatures only focus on the potential AI in healthcare system which already mature, the implementation of AI in development country such as Indonesia with limited resources will has promising for advancing

healthcare equity. Based on the previous studies we can enhance healthcare equity: Which AI help overcome geographical barriers and resource constraints to provide quality healthcare access to underserved populations in Indonesia? Examining the potential for telemedicine, remote monitoring[50], and AI-powered diagnostic tools in rural areas could be beneficial. Previous study[51] mentions mobile diagnostic clinics which could be explored in relation to AI's potential in Indonesian healthcare equity. Another benefit and potential AI outcomes is increase efficiency and reduce costs with the question: Can AI automate tasks, streamline workflows, and optimize resource allocation in Indonesian hospitals, leading to cost savings and improved healthcare delivery? Research should consider the specific resource constraints and operational challenges within the Indonesian healthcare system. Many literature which found speaks of AI's role in integrating clinical systems[52], which may address some of these challenges[18]. AI also can empower mobile diagnostic clinics with advanced diagnostic capabilities, bringing essential healthcare services to underserved populations[53]. Combining AI with mobile healthcare initiatives, as suggested by Source, can be a powerful strategy for expanding healthcare access in Indonesia.

While the potential benefits of AI in Indonesian hospitals are substantial, realizing these benefits ethically and responsibly requires addressing potential risks[54] and implementing safeguards such as developing context-specific ethical guidelines which crucial in Indonesian context. Another consideration is regarding Indonesian culture which must always highlight their local cultural values and sensitivities. For example, study discusses the importance of respecting cultural norms in AI implementation[3]. Regarding previous literatures, there is need regulatory alignment and guidelines in existing healthcare regulations and data protection laws in Indonesia. They emphasizes the need for legal and ethical frameworks to govern AI development and deployment[53]. Several other important things to consider about how challenges or opportunities can be utilized as benefits in the application of AI that are in line with local ethics are addressing data bias, promoting fairness[19], for example from a study related to underscores the need for divers' datasets to avoid algorithmic bias[3]. Another thing is to provide certainty of privacy and security of patient data. This is urgent considering that recently there have been cases of violations of personal data that have been leaked in the regulatory environment. Of course, there must be an acceleration in the creation of policies such as the PDP Law in Indonesia including the implementation of cybersecurity for patient data security and transparency in the use of patient data[53]. The last and most important thing is for the success of the implementation of AI in the long term. The need to conduct a cost-effectiveness analysis, integration with existing infrastructure and expediting the implementation in a feasible pilot project so that it can be run on a wider scale.

IV. CONCLUSION

Chemical This study consistently emphasizes AI's potential to revolutionize healthcare in Indonesia. There are key benefits identified include enhanced diagnostic accuracy and personalized treatment, improved healthcare equity, increased efficiency and potential cost reductions. However, the study also cautions that realizing these benefits responsibly necessitates careful consideration of ethical risks and the implementation of appropriate safeguards which has some key considerations highlighted include developing context-specific ethical guidelines, addressing data bias and promoting fairness, ensuring privacy and security of patient data, developing education and training programs.This review concludes that AI implementation in Indonesian Hospital come with significantly opportunity for increasing patient healthcare outcome and equality of healthcare services. However, achieving the benefits sustainably requires a proactive approach regarding ethical conciderations. Prioritation for development and implementation of responsible AI, Indonesia can harness AI's power to transform its healthcare system for the benefit of all.

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REFERENCES

[1] T. Hofweber and R. L. Walker, "Machine Learning in Health Care: Ethical Considerations Tied to Privacy, Interpretability, and Bias," ***N C Med J***, vol. 85, no. 4, Jul. 2024, doi: 10.18043/001c.120562.

[2] A. Caglayan, W. Slusarczyk, R. D. Rabbani, A. Ghose, V. Papadopoulos, and S. Boussios, "Large Language Models in Oncology: Revolution or Cause for Concern?," *Current Oncology*, vol. 31, no. 4, pp. 1817–1830, Mar. 2024, doi: 10.3390/curroncol31040137.

[3] M. Mirbabaie, L. Hofeditz, N. R. J. Frick, and S. Stieglitz, "Artificial intelligence in hospitals: providing a status quo of ethical considerations in academia to guide future research," *AI Soc*, vol. 37, no. 4, pp. 1361–1382, Dec. 2022, doi: 10.1007/s00146-021-01239-4.

[4] M. Nair, P. Svedberg, I. Larsson, and J. M. Nygren, "A comprehensive overview of barriers and strategies for AI implementation in healthcare: Mixed-method design," *PLoS One*, vol. 19, no. 8, p. e0305949, Aug. 2024, doi: 10.1371/journal.pone.0305949.

[5] S. Roy, T. Meena, and S.-J. Lim, "Demystifying Supervised Learning in Healthcare 4.0: A New Reality of Transforming Diagnostic Medicine," *Diagnostics*, vol. 12, no. 10, p. 2549, Oct. 2022, doi: 10.3390/diagnostics12102549.

[6] M. U. Aleem, J. A. Khan, A. Younes, B. N. Sabbah, W. Saleh, and M. Migliore, "Enhancing Thoracic Surgery with AI: A Review of Current Practices and Emerging Trends," *Current Oncology*, vol. 31, no. 10, pp. 6232–6244, Oct. 2024, doi: 10.3390/curroncol31100464.

[7] L. Farah, I. Borget, N. Martelli, and A. Vallee, "Suitability of the Current Health Technology Assessment of Innovative Artificial Intelligence-Based Medical Devices: Scoping Literature Review," ***J Med Internet Res***, vol. 26, p. e51514, May 2024, doi: 10.2196/51514.

[8] B. Barbazzeni, S. Haider, and M. Friebe, "Engaging Through Awareness: Purpose-Driven Framework Development to Evaluate and Develop Future Business Strategies With Exponential Technologies Toward Healthcare Democratization," *Front Public Health*, vol. 10, p. 851380, May 2022, doi: 10.3389/fpubh.2022.851380.

[9] S. N. Saw, "Current challenges of implementing artificial intelligence in medical imaging," *Physica Medica*, vol. 100, pp. 12–17, 2022, doi: 10.1016/j.ejmp.2022.06.003.

[10] Y.-H. Li, Y.-L. Li, M.-Y. Wei, and G.-Y. Li, "Innovation and challenges of artificial intelligence technology in personalized healthcare," *Sci Rep*, vol. 14, no. 1, p. 18994, Aug. 2024, doi: 10.1038/s41598-024-70073-7.

[11] N. Biller, "AI support for ethical decision-making around resuscitation: proceed with care".

[12] M. Prochaska and D. Alfandre, "Artificial intelligence, ethics, and hospital medicine: Addressing challenges to ethical norms and patient-centered care," ***J Hosp Med***, vol. 19, no. 12, pp. 1194–1196, Dec. 2024, doi: 10.1002/jhm.13364.

[13] D. Wijayanti, E. I. H. Ujianto, and R. Rianto, "Uncovering Security Vulnerabilities in Electronic Medical Record Systems: A Comprehensive Review of Threats and Recommendations for Enhancement," *Jurnal Ilmiah Teknik Elektro Komputer dan Informatika*, vol. 10, no. 1, p. 73, Feb. 2024, doi: 10.26555/jiteki.v10i1.28192.

[14] M. Almansour and F. M. Alfhaid, "Generative artificial intelligence and the personalization of health professional education: A narrative review," *Medicine*, vol. 103, no. 31, p. e38955, Aug. 2024, doi: 10.1097/MD.0000000000038955.

[15] N. Freyer, D. Groß, and M. Lipprandt, "The ethical requirement of explainability for AI-DSS in healthcare: a systematic review of reasons," *BMC Med Ethics*, vol. 25, no. 1, p. 104, Oct. 2024, doi: 10.1186/s12910-024-01103-2.

[16] J. C. L. Ong *et al.*, "Ethical and regulatory challenges of large language models in medicine," *Lancet Digit Health*, vol. 6, no. 6, pp. e428–e432, Jun. 2024, doi: 10.1016/S2589-7500(24)00061-X.

[17] S. Lewin, R. Chetty, A. R. Ihdayhid, and G. Dwivedi, "Ethical Challenges and Opportunities in Applying Artificial Intelligence to Cardiovascular Medicine," ***Canadian Journal of Cardiology***, vol. 40, no. 10, pp. 1897–1906, Oct. 2024, doi: 10.1016/j.cjca.2024.06.029.

[18] E. C. Berghea *et al.*, "Integrating Artificial Intelligence in Pediatric Healthcare: Parental Perceptions and Ethical Implications," *Children*, vol. 11, no. 2, p. 240, Feb. 2024, doi: 10.3390/children11020240.

[19] D. Ueda *et al.*, "Fairness of artificial intelligence in healthcare: review and recommendations," ***Jpn J Radiol,*** vol. 42, no. 1, pp. 3–15, Jan. 2024, doi: 10.1007/s11604-023-01474-3.

[20] E. Ullah, A. Parwani, M. M. Baig, and R. Singh, "Challenges and barriers of using large language models (LLM) such as ChatGPT for diagnostic medicine with a focus on digital pathology – a recent scoping review," *Diagn Pathol*, vol. 19, no. 1, p. 43, Feb. 2024, doi: 10.1186/s13000-024-01464-7.

[21] C. Elendu, E. K. Omeludike, P. O. Oloyede, B. T. Obidigbo, and J. C. Omeludike, "Legal implications for clinicians in cybersecurity incidents: A review," *Medicine*, vol. 103, no. 39, p. e39887, Sep. 2024, doi: 10.1097/MD.0000000000039887.

[22] S. Reddy, "Generative AI in healthcare: an implementation science informed translational path on application, integration and governance," *Implementation Science*, vol. 19, no. 1, p. 27, Mar. 2024, doi: 10.1186/s13012-024-01357-9.

[23] R. G. L. da Silva, "The advancement of artificial intelligence in biomedical research and health innovation: challenges and opportunities in emerging economies," *Global Health*, vol. 20, no. 1, p. 44, May 2024, doi: 10.1186/s12992-024-01049-5.

[24] T. Nakaura *et al.*, "The impact of large language models on radiology: a guide for radiologists on the latest innovations in AI," ***Jpn J Radiol***, vol. 42, no. 7, pp. 685–696, Jul. 2024, doi: 10.1007/s11604-024-01552-0.

[25] P. P. Sengupta, D. Dey, R. H. Davies, N. Duchateau, and N. Yanamala, "Challenges for augmenting intelligence in cardiac imaging," *Lancet Digit Health*, vol. 6, no. 10, pp. e739–e748, Oct. 2024, doi: 10.1016/S2589-7500(24)00142-0.

[26] B. T. ElHassan and A. A. Arabi, "Ethical forethoughts on the use of artificial intelligence in medicine," ***International Journal of Ethics and Systems***, Apr. 2024, doi: 10.1108/IJOES-08-2023-0190.

[27] J. Miao, C. Thongprayoon, S. Suppadungsuk, P. Krisanapan, Y. Radhakrishnan, and W. Cheungpasitporn, "Chain of Thought Utilization in Large Language Models and Application in Nephrology," *Medicina (B Aires)*, vol. 60, no. 1, p. 148, Jan. 2024, doi: 10.3390/medicina60010148.

[28] K. W. Park, M. S. Mirian, and M. J. McKeown, "Artificial intelligence-based video monitoring of movement disorders in the elderly: a review on current and future landscapes," ***Singapore Med J***, vol. 65, no. 3, pp. 141–149, Mar. 2024, doi: 10.4103/singaporemedj.SMJ-2023-189.

[29] A. Haque, A. Milstein, and L. Fei-Fei, "Illuminating the dark spaces of healthcare with ambient intelligence," *Nature*, vol. 585, no. 7824, pp. 193–202, Sep. 2020, doi: 10.1038/s41586-020-2669-y.

[30] S. Freeman *et al.*, "Health consumers' ethical concerns towards artificial intelligence in Australian emergency departments," *Emergency Medicine Australasia*, vol. 36, no. 5, pp. 768–776, Oct. 2024, doi: 10.1111/1742-6723.14449.

[31] M. Laymouna, Y. Ma, D. Lessard, T. Schuster, K. Engler, and B. Lebouché, "Roles, Users, Benefits, and Limitations of Chatbots in Health Care: Rapid Review," ***J Med Internet Res***, vol. 26, p. e56930, Jul. 2024, doi: 10.2196/56930.

[32] H. Guan *et al.*, "The role of machine learning in advancing diabetic foot: a review," *Front Endocrinol (Lausanne)*, vol. 15, Apr. 2024, doi: 10.3389/fendo.2024.1325434.

[33] S. Jalal, W. Parker, D. Ferguson, and S. Nicolaou, "Exploring the Role of Artificial Intelligence in an Emergency and Trauma Radiology Department," ***Canadian Association of Radiologists Journal***, vol. 72, no. 1, pp. 167–174, Feb. 2021, doi: 10.1177/0846537120918338.

[34] P. J. Thoral *et al.*, "Sharing ICU Patient Data Responsibly Under the Society of Critical Care Medicine/European Society of Intensive Care Medicine Joint Data Science Collaboration: The Amsterdam University Medical Centers Database (AmsterdamUMCdb) Example*," *Crit Care Med*, vol. 49, no. 6, pp. e563–e577, Jun. 2021, doi: 10.1097/CCM.0000000000004916.

[35] S. C. Clark, "Can ChatGPT transform cardiac surgery and heart transplantation?," ***J Cardiothorac Surg***, vol. 19, no. 1, p. 108, Feb. 2024, doi: 10.1186/s13019-024-02541-0.

[36] E. Hashmi, M. M. Yamin, and S. Y. Yayilgan, "Securing tomorrow: a comprehensive survey on the synergy of Artificial Intelligence and information security," *AI and Ethics*, Jul. 2024, doi: 10.1007/s43681-024-00529-z.

[37] I. J. Tan, O. M. Katamanin, R. K. Greene, and M. Jafferany, "Artificial intelligence in psychodermatology: A brief report of applications and impact in clinical practice," *Skin Research and Technology*, vol. 30, no. 9, p. e70044, Sep. 2024, doi: 10.1111/srt.70044.

[38] F. McKay, B. J. Williams, G. Prestwich, D. Bansal, N. Hallowell, and D. Treanor, "The ethical challenges of artificial intelligence-driven digital pathology," ***J Pathol Clin Res***, vol. 8, no. 3, pp. 209–216, May 2022, doi: 10.1002/cjp2.263.

[39] Y. D. Prabowo, A. I. Kristijantoro, H. L. H. S. Warnars, and W. Budiharto, "Systematic literature review on abstractive text summarization using kitchenham method," *ICIC Express Letters, Part B: Applications*, vol. 12, no. 11, 2021, doi: 10.24507/icicelb.12.11.1075.

[40] D. Moher *et al.*, "Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement," 2009. doi: 10.1371/journal.pmed.1000097.

[41] Meyliana, A. N. Hidayanto, and E. K. Budiardjo, "The critical success factors for customer relationship management implementation: A systematic literature review," 2016. doi: 10.1504/IJBIS.2016.078904.

[42] M. Kundrotas, E. Mažonienė, and D. Šešok, "Automatic Tumor Identification from Scans of Histopathological Tissues," *Applied Sciences*, vol. 13, no. 7, p. 4333, Mar. 2023, doi: 10.3390/app13074333.

[43] Z. Chen *et al.*, "Exploring explainable AI features in the vocal biomarkers of lung disease," *Comput Biol Med*, vol. 179, p. 108844, Sep. 2024, doi: 10.1016/j.compbiomed.2024.108844.

[44] W. Cheungpasitporn, C. Thongprayoon, and K. B. Kashani, "Artificial Intelligence in Heart Failure and Acute Kidney Injury: Emerging Concepts and Controversial Dimensions," *Cardiorenal Med*, Feb. 2024, doi: 10.1159/000537751.

[45] A. A. Nichol, J. N. Batten, M. C. Halley, J. K. Axelrod, P. L. Sankar, and M. K. Cho, "A typology of existing machine learning-based predictive analytic tools focused on reducing costs and improving quality in health care: Systematic search and content analysis," ***J Med Internet Res***, vol. 23, no. 6, 2021, doi: 10.2196/26391.

[46] C. D. M. Van Karnebeek *et al.*, "Leaving no patient behind! Expert recommendation in the use of innovative technologies for diagnosing rare diseases," ***Orphanet J Rare Dis***, vol. 19, no. 1, p. 357, Sep. 2024, doi: 10.1186/s13023-024-03361-0.

[47] C. Carini and A. A. Seyhan, "Tribulations and future opportunities for artificial intelligence in precision medicine," ***J Transl Med,*** vol. 22, no. 1, p. 411, Apr. 2024, doi: 10.1186/s12967-024-05067-0.

[48] D. Abdulkarim and A. M. Abdulazeez, "Machine Learning-Based Prediction of Thalassemia: A Review," ***Indonesian Journal of Computer Science***, vol. 13, no. 3, Jun. 2024, doi: 10.33022/ijcs.v13i3.4035.

[49] B. A. Sullivan *et al.*, "Transforming neonatal care with artificial intelligence: challenges, ethical consideration, and opportunities," 2024. doi: 10.1038/s41372-023-01848-5.

[50] M. Geny, E. Andres, S. Talha, and B. Geny, "Liability of Health Professionals Using Sensors, Telemedicine and Artificial Intelligence for Remote Healthcare," *Sensors*, vol. 24, no. 11, p. 3491, May 2024, doi: 10.3390/s24113491.

[51] R. Baron and H. Haick, "Mobile Diagnostic Clinics," *ACS Sens*, vol. 9, no. 6, pp. 2777–2792, Jun. 2024, doi: 10.1021/acssensors.4c00636.

[52] D. De Gonzalo-Calvo *et al.*, "Machine learning for catalysing the integration of noncoding RNA in research and clinical practice," *EBioMedicine*, vol. 106, p. 105247, Aug. 2024, doi: 10.1016/j.ebiom.2024.105247.

[53] E. Chikhaoui, A. Alajmi, and S. Larabi-Marie-Sainte, "Artificial Intelligence Applications in Healthcare Sector: Ethical and Legal Challenges," ***Emerging Science Journal***, vol. 6, no. 4, pp. 717–738, May 2022, doi: 10.28991/ESJ-2022-06-04-05.

[54] K. Denecke, R. May, and O. Rivera-Romero, "Transformer Models in Healthcare: A Survey and Thematic Analysis of Potentials, Shortcomings and Risks," 2024. doi: 10.1007/s10916-024-02043-5.