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STATE LIABILITY IN EFFORTS TO PROTECT PATIENTS' RIGHTS TO CHOOSE HEALTH CARE FACILITIES IN THE FORM OF VACCINES AS A FORM OF HUMAN RIGHTS ENFORCEMENT

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ABSTRACT

Health is a fundamental aspect of human life, and the right to choose health care facilities, including vaccination, is crucial to the enforcement of human rights. In the digital age, the role of Artificial Intelligence (AI) in optimizing health services, particularly in vaccination distribution and monitoring, has become significant. AI systems can enhance transparency, accuracy, and accessibility in providing health care, but they also raise questions about accountability and ethical concerns. This study examines the state's responsibility in regulating the use of AI for the protection of patients' rights, focusing on AI's role in ensuring safe, licensed vaccines for children and equitable access to healthcare facilities. The study also analyses how AI could improve the state's efforts in fulfilling its human rights obligations by making healthcare more efficient and inclusive. A normative juridical method is employed, using a statutory and analytical approach, to explore the legal frameworks governing AI in health care and the state's responsibility. The findings reveal gaps in current legal protections against the use of unlicensed vaccines, and the unequal access to AI-supported health services for vulnerable groups, such as children. While AI can help identify and distribute vaccines more effectively, the state has yet to fully implement regulations that guarantee fairness and safety in AI-driven health services. The integration of AI into healthcare poses both opportunities and challenges, and the state must strengthen its accountability mechanisms to ensure AI supports human rights, especially children's right to access safe and reliable vaccinations.

INTRODUCTION

Health is a fundamental right recognized worldwide, as it directly influences the quality of life and well-being of individuals. According to the Universal Declaration of Human Rights (UDHR), Article 25, every individual has the right to a living level sufficient for their own and their families' health and well-being. According to the 1945 Constitution, Article 27, every person is equal before the law and the government and is expected to uphold them without exception (Amelia, 2023). This right includes access to essential medical services, which includes vaccinations. In this regard, states have an inherent responsibility to ensure that all citizens, particularly vulnerable groups like children, have access to safe, reliable, and equitable healthcare services, including vaccines.

In the context of healthcare delivery, the principle of patient autonomy, including the right to choose health care facilities, plays a central role. Patients should have the freedom to select the services that best meet their needs and preferences (Reinke & Gerlach, 2022). This choice is not only essential to

individual health but is also a reflection of the state's obligation to protect human rights. Access to vaccines, as part of preventative healthcare, is crucial in preventing the spread of diseases and safeguarding public health. Vaccination programs protect both individuals and communities by fostering herd immunity, which further underlines the state's duty in facilitating equitable vaccine distribution and access.

In Indonesia, the right to healthcare is guaranteed under the Constitution, specifically Article 28H(1) of the 1945 Constitution, which guarantees that every citizen is entitled to good health and well-being (Assiddiqie, 2015). Furthermore, Law No. 17 of 2023 on Health reinforces the state's responsibility in ensuring the availability of health services, including vaccination programs, which are essential for public health. This law replaces the former Law No. 36 of 2009 on Health, ensuring more up-to-date regulations that reflect the current needs of healthcare management in Indonesia, especially as they pertain to technological advancements (Andino & Paula, 2023).

The advent of Artificial Intelligence (AI) has introduced transformative changes in various sectors, including healthcare. AI technologies have the potential to significantly enhance healthcare delivery by improving diagnostics, streamlining medical services, and personalizing patient care. One of the most promising applications of AI in the healthcare sector is in the distribution and monitoring of vaccines. The amount of research on AI in the field of medicine and health has grown rapidly and gained popularity over the past decade (Tran et al., 2019). Today's data-rich healthcare ecosystem offers many possibilities for AI developers and AI offers ways to reduce costs and improve the efficiency of nursing services (Matheny et al., 2020).

Despite these legal provisions, there are still gaps in the regulatory framework governing the use of AI in healthcare. For instance, while AI can significantly enhance the efficiency and effectiveness of vaccination programs, the lack of clear regulations on data privacy, accountability, and the ethical use of AI poses risks to patient rights (Gholami et al., 2021). It is imperative for Indonesia to develop comprehensive legal frameworks that address these concerns, ensuring that the use of AI in healthcare does not infringe on patient autonomy or exacerbate existing inequalities.

One of the key challenges in the implementation of AI in healthcare is ensuring that its use is consistent with the principles of justice and equity. AI systems, if not properly regulated, can reinforce existing biases and lead to unequal access to health services. For example, AI algorithms trained on biased data can result in unequal distribution of vaccines, where certain population groups are either neglected or disproportionately prioritized (Indra, 2014). In this context, the state has a responsibility to ensure that AI technologies used in healthcare are designed and implemented in a way that upholds human rights and ensures equitable access to health services for all citizens.

State liability in ensuring access to healthcare is a crucial aspect of human rights enforcement. The state is responsible for creating a legal and institutional framework that guarantees that all citizens have access to essential healthcare services, including vaccines. The state must ensure that these services are provided in a fair, transparent, and non-discriminatory manner (Sujood et al., 2023). This responsibility extends to regulating the use of AI in healthcare to ensure that it enhances, rather than undermines, the right to health.

The state's failure to ensure equitable access to vaccines, including through AI-based systems, can be seen as a violation of its human rights obligations. This is particularly important in the case of children, who are among the most vulnerable groups in society and have specific health needs (Daly & Leviner, 2022). The state must ensure that children have access to safe, reliable vaccines and that their parents have the right to choose appropriate health services for them. The use of unlicensed or unsafe vaccines is a significant threat to children's health and safety, and the state must take active measures to prevent the circulation and use of such vaccines.

In the context of AI, state liability also extends to ensuring that AI systems used in healthcare are safe, transparent, and accountable. The state must establish legal frameworks that regulate the use of AI in healthcare, ensuring that these systems are designed and used in a way that respects human rights. This includes ensuring that AI systems do not perpetuate inequalities or create new forms of discrimination in access to health services.

This study examines the state's responsibility in regulating the use of AI for the protection of patients' rights, focusing on AI's role in ensuring safe, licensed vaccines for children and equitable access to healthcare facilities. The study also analyses how AI could improve the state's efforts in fulfilling its human rights obligations by making healthcare more efficient and inclusive. The research contribution of this study lies in its exploration of the state's role and responsibility in regulating artificial intelligence

(AI) to protect patients' rights, with a specific focus on child healthcare. By analyzing AI's potential in ensuring safe, licensed vaccines and equitable access to healthcare facilities, the study offers insights into how AI can enhance state accountability in fulfilling human rights obligations. It contributes to the discourse on AI ethics and governance by highlighting how AI could make healthcare delivery more efficient, inclusive, and aligned with human rights principles, potentially guiding policy development to integrate AI responsibly in healthcare systems.

METHODS

The research employed a normative juridical method, focusing on the examination of legal principles, rules, and regulations pertinent to the state's responsibility in safeguarding patients' rights to select healthcare facilities for vaccine services. This method involved a comprehensive analysis of statutory provisions, including Law No. 17 of 2023 on Health, relevant government regulations, and international human rights standards, to assess the state's obligations in promoting equitable access to healthcare. Utilizing both statutory and conceptual approaches, the study systematically interpreted and evaluated the legal framework, judicial precedents, and doctrinal sources that govern vaccine distribution and patient rights within the healthcare system. This structured approach aimed to provide a robust understanding of how existing legal instruments and principles support patient rights and healthcare accessibility in vaccine services.

RESULTS

State Responsibility in Protecting Patients' Rights to Choose Health Care Facilities

In healthcare systems worldwide, the state's role is fundamental in ensuring the protection of patients' rights, including the right to choose healthcare facilities. This responsibility becomes particularly crucial in the context of vaccine services, where access to safe and effective vaccines is vital to public health. The state is not only tasked with providing healthcare services but also with ensuring that these services are delivered equitably, allowing individuals to make informed choices about their healthcare, including the choice of vaccination facilities. The assurance of health is a fundamental tenet of the human rights guarantees enshrined in Indonesian legislation, which affords all Indonesian citizens the aforementioned rights. The concept of human rights encompasses the fundamental and inherent protections afforded to citizens. The objective of this policy is to guarantee the provision of equitable and impartial healthcare services for all by utilizing a premium-based system that is analogous to the standard practices observed in the domain of health insurance (Suprapto & Malik, 2019).

The foundation of patients' rights, including the right to access healthcare facilities, is supported by both international and national legal instruments. On the global level, the International Covenant on Economic, Social and Cultural Rights (ICESCR) outlines the right of every individual to the highest attainable standard of health. Article 12 of this covenant obligates state parties to take necessary steps for the prevention, treatment, and control of diseases, and to ensure access to healthcare facilities. This legal framework emphasizes the state's responsibility to create conditions that allow everyone to access and choose healthcare services freely, including vaccination (Ardiyantini, 2021).

In Indonesia, the protection of health rights is outlined in Law No. 17 of 2023 on Health, which replaced the previous Law No. 36 of 2009 on Health. This law provides a comprehensive framework for regulating healthcare services, including provisions on patient rights. Article 4 explicitly states that every person has the right to access safe, high-quality, and affordable healthcare services. Additionally, Article 27 highlights the importance of non-discrimination in healthcare delivery, ensuring that all citizens, regardless of their background, have the same opportunity to access health services, including vaccines.

The right to choose healthcare facilities, specifically in the context of vaccine services, is an essential part of protecting public health. Vaccination services, especially during pandemics or mass immunization campaigns, require careful regulation to ensure that citizens have access to licensed and reliable healthcare providers. The Law No. 17 of 2023 also addresses the state's responsibility to regulate and monitor healthcare providers, ensuring that vaccines are distributed and administered in compliance with safety standards.

One of the key components of protecting patients' rights is ensuring that individuals can make informed choices about their healthcare. In the context of vaccine services, this means that patients must have access to clear, accurate information about the vaccines available, the healthcare facilities providing them, and the potential benefits and risks of different vaccine options.

In Indonesia, Law No. 8 of 1999 on Consumer Protection plays a significant role in safeguarding the rights of patients, particularly in their capacity as healthcare consumers. Under this law, healthcare providers, including those offering vaccine services, are required to provide accurate and transparent information about the products and services they offer. This ensures that patients can make informed decisions when choosing a healthcare facility for vaccination, including factors like the type of vaccine offered, the cost, and the facility's reputation for safety and reliability.

The state's responsibility in this area is twofold: first, it must ensure that healthcare providers comply with regulations requiring transparency and the provision of accurate information; second, it must provide oversight and accountability mechanisms to protect patients from fraudulent or misleading practices, particularly in the case of unlicensed vaccines or unqualified providers.

The equitable distribution of vaccines is a critical aspect of the state's responsibility in healthcare. Ensuring that vaccines are accessible to all segments of society, regardless of location or socio-economic status, is essential to protecting public health and safeguarding the right of patients to choose healthcare facilities (Hasim et al., 2018).

In Indonesia, the National Immunization Program (NIP), regulated under Presidential Regulation No. 99 of 2020 on the Procurement and Implementation of Vaccines, outlines the state's approach to vaccine distribution. This regulation mandates the government to ensure that vaccines are available and accessible to all citizens, particularly in public health emergencies. The government is responsible for coordinating with regional authorities to ensure that vaccines are distributed equitably, taking into account factors such as population density, healthcare infrastructure, and the vulnerability of different populations. However, challenges remain in ensuring that all citizens have access to the same level of healthcare services, particularly in rural and remote areas where healthcare infrastructure is less developed. In these areas, the choice of healthcare facilities may be limited, and patients may have fewer options when it comes to selecting a provider for vaccine services (Rumawas, 2022). This underscores the importance of state intervention to ensure that healthcare services, including vaccinations, are available in underserved areas.

To address this, the state must not only invest in healthcare infrastructure but also implement policies that prioritize the distribution of vaccines to areas with limited access to healthcare services. Law No. 17 of 2023 places significant emphasis on the state's obligation to ensure that healthcare services, including vaccines, are accessible to all citizens, regardless of their geographic location or economic status. The law also highlights the state's role in ensuring that private healthcare providers, who may offer vaccines at higher prices, are regulated to prevent excessive fees that could limit access for lower-income populations.

The state's responsibility extends beyond providing access to healthcare facilities; it also includes ensuring that these facilities meet safety and quality standards. This is particularly important in the context of vaccine services, where the use of unlicensed or substandard vaccines can pose significant risks to public health.

The circulation of unlicensed vaccines is a major concern, and it is the state's responsibility to regulate and monitor healthcare providers to prevent the use of unsafe vaccines. Law No. 17 of 2023 places strict requirements on the licensing of healthcare providers and the approval of vaccines, ensuring that only certified vaccines are distributed and administered to the public. The law also includes provisions for penalizing healthcare providers who fail to comply with safety regulations, ensuring accountability in the healthcare sector.

The state's regulatory role is also supported by Government Regulation No. 39 of 2023 on Health Services, which outlines the procedures for licensing healthcare facilities and monitoring their compliance with safety standards. Under this regulation, healthcare providers offering vaccination services must adhere to strict guidelines regarding the storage, handling, and administration of vaccines. This ensures that patients have access to safe and effective vaccines, regardless of the healthcare facility they choose.

In addition to regulatory oversight, the state must also provide mechanisms for patients to report safety concerns or adverse reactions to vaccines. This is particularly important in ensuring that patients feel confident in the healthcare system and are able to make informed choices about their vaccination options. Law No. 17 of 2023 emphasizes the importance of public health reporting systems, allowing patients to file complaints and ensuring that healthcare providers are held accountable for any breaches in safety or quality standards.

Despite the legal frameworks in place, there are still significant challenges in ensuring that patients' rights to choose healthcare facilities for vaccination are fully protected. One of the key challenges is the economic disparity between different regions, which affects the availability and affordability of healthcare services (Oppong et al., 2023). In urban areas, patients often have access to a wide range of healthcare facilities, both public and private, giving them more options when it comes to selecting a provider for vaccination. However, in rural and remote areas, healthcare facilities may be limited, and patients may have no choice but to rely on government-run clinics, which may face supply shortages or delays in vaccine distribution (Sudiana et al., 2022).

Additionally, the cost of vaccines can vary significantly between public and private healthcare providers, with private facilities often charging higher fees for vaccinations. This creates a disparity in access to vaccines, particularly for low-income families who may not be able to afford the higher fees charged by private providers. To address this, the state must implement policies that regulate the pricing of vaccines and ensure that affordable options are available to all citizens.

Another challenge is ensuring that healthcare providers in both public and private sectors are adequately trained and equipped to administer vaccines safely. This requires ongoing investment in healthcare infrastructure, as well as continuous professional development for healthcare workers (Allen, 2023). The state's role in this regard is to provide funding and support for training programs, ensuring that healthcare providers are equipped to offer high-quality vaccine services.

The Role of AI in Addressing Challenges in Protecting Patients' Rights to Choose Health Care Facilities for Vaccine Services

Artificial Intelligence (AI) offers significant potential to enhance the efficiency and inclusivity of healthcare systems, particularly in vaccine distribution, thus supporting the state's efforts to fulfil its human rights obligations (Gerich et al., 2022). By leveraging AI, governments can streamline complex processes, improve the accuracy of vaccine allocation, and ensure that healthcare services are delivered more equitably across populations. Deep learning, artificial neural networks (ANNs), and machine learning (ML) techniques are the three main categories of AI techniques. Information systems, sensors, electronic health records, electronic surveys, camera or picture datasets, and structured and unstructured data are among the data sources used to train, test, and verify AI-based solutions (Gerich et al., 2022).

AI is a replica of human intelligence in devices such as computers or robots that are built to mimic human cognitive processes, such as learning and problem-solving (Lee & Yoon, 2021). AI can be defined as a software or hardware system that has been created by humans with complex goals. It can act in a physical or digital dimension and understand the environment through data acquisition, interpret structured or unstructured data, reason, process information derived from data, and determine the best course of action to take in order to accomplish a particular goal (European Commission, 2018). One of the most notable benefits of AI in healthcare is its ability to analyse large datasets to optimize resource allocation. AI algorithms can process information on population demographics, disease outbreaks, and geographic factors to predict where vaccines are most needed. The application of AI technology aims to collect personal health data from home monitoring sensors, activity trackers, national electronic health records, and care reports (Kitula et al., 2018). The application of AI in health services has an impact on physical activity, movement, or patient response. In addition, AI technology is capable of detecting Length of Stay (LOS), death, ulcers, and handwashing skills (Seibert et al., 2021). This capability allows governments to allocate vaccines more efficiently, ensuring that they reach high-risk populations in a timely manner. For instance, AI can forecast vaccine demand in specific areas, helping to prevent shortages and ensuring that vaccines are available when and where they are most needed.

This predictive capacity is especially valuable in managing public health emergencies, such as pandemics, where timely and accurate distribution of vaccines can save lives. By using AI to identify areas where infections are likely to spread, governments can prioritize vaccine distribution to those regions, reducing the overall impact of the outbreak. Additionally, AI can help identify patterns in vaccine uptake, allowing policymakers to adjust their strategies and focus on areas where vaccination rates are low.

Enhancing Vaccine Distribution through AI

One of the major challenges faced by healthcare systems worldwide, including Indonesia, is the equitable distribution of vaccines. In rural or remote areas, access to healthcare facilities may be limited,

and patients often have fewer options when it comes to receiving vaccinations. AI has the potential to streamline the logistics of vaccine distribution, ensuring that vaccines are delivered efficiently and equitably across different regions.

AI-driven supply chain management systems can predict demand for vaccines in different areas based on population data, vaccination rates, and disease outbreaks. By using machine learning algorithms, these systems can identify areas that are underserved and prioritize the delivery of vaccines to those regions. This predictive capability is particularly useful in responding to dynamic changes in healthcare needs, such as during pandemics or sudden disease outbreaks, where vaccine supply needs to be quickly adjusted to meet increased demand.

Another advantage of AI is its potential to improve the inclusivity of healthcare services. In countries like Indonesia, where there are significant disparities between urban and rural healthcare access, AI can play a critical role in addressing these gaps. AI systems can analyse data from remote and underserved areas to identify healthcare needs that might otherwise go unnoticed. For example, AI can help map out areas where vaccine distribution is lagging and develop targeted strategies to address these gaps, such as deploying mobile health clinics or partnering with local healthcare providers to ensure that vaccines are available to all citizens, regardless of their location.

For instance, in Indonesia, where geographical challenges can hinder vaccine access in remote areas, AI can be used to forecast which regions are at risk of vaccine shortages and direct additional resources to those areas. This can help ensure that patients in rural areas have the same access to vaccines as those in urban centres, reducing disparities in healthcare access. AI can also optimize the transportation routes for delivering vaccines, reducing the risk of delays and ensuring that vaccines are distributed promptly to healthcare facilities across the country.

Improving Patient Access to Information through AI

One of the critical components of protecting patients' rights to choose healthcare facilities is ensuring that they have access to accurate and timely information. In the context of vaccine services, patients need to know which healthcare facilities offer vaccines, the types of vaccines available, and the safety and efficacy of those vaccines. AI can enhance the availability and dissemination of this information, empowering patients to make informed decisions about their healthcare.

AI-powered platforms can aggregate data from various healthcare providers and present it to patients in a user-friendly format. These platforms can include information on the location of healthcare facilities, the availability of vaccines, and patient reviews or safety ratings for each facility. By centralizing this information, AI enables patients to compare different options and choose the healthcare facility that best meets their needs (Schepman & Rodway, 2023).

In addition, natural language processing (NLP) algorithms can be used to analyse vast amounts of healthcare data and generate easy-to-understand summaries for patients. For example, AI-driven chatbots or virtual assistants can provide real-time answers to patient queries about vaccine options, costs, and appointment availability. This reduces the burden on healthcare providers and makes it easier for patients to access information without delays. Moreover, AI can support multilingual capabilities, breaking down language barriers that may prevent some patients from accessing critical information about vaccines.

AI for Personalized Vaccine Recommendations

Another significant role AI can play in vaccine services is in providing personalized recommendations based on individual patient data. By analysing patient health records, vaccination history, and risk factors, AI algorithms can offer tailored advice on which vaccines a patient should receive and when. This level of personalization is especially important for patients with underlying health conditions or those who may be at higher risk of vaccine-preventable diseases. AI can also support personalized healthcare by helping to tailor vaccination programs to the specific needs of individuals. By analysing patients' medical histories, AI can recommend the most appropriate vaccines based on factors such as age, underlying health conditions, and previous immunization records. This level of personalization ensures that individuals receive vaccines that are best suited to their health needs, improving overall public health outcomes.

For example, AI systems can analyse a patient's medical history to identify any contraindications for specific vaccines, such as allergies or adverse reactions to certain vaccine components. This allows healthcare providers to offer safer and more effective vaccination options. AI can also predict the

likelihood of vaccine effectiveness for individual patients based on factors such as age, health status, and genetic predispositions. By offering personalized recommendations, AI helps patients make more informed choices and reduces the risk of adverse reactions. In Indonesia, where vaccine hesitancy remains a challenge in certain communities, AI-driven personalization can help build trust in the healthcare system. By providing tailored recommendations that consider individual patient needs, AI can address concerns about vaccine safety and efficacy, ultimately improving vaccination rates.

Reducing Costs and Improving Efficiency in Vaccine Services

One of the barriers to accessing healthcare facilities, particularly in the context of vaccine services, is the cost associated with receiving vaccines. While public health programs aim to provide free or subsidized vaccines, private healthcare providers may charge higher fees, limiting access for lower-income patients. AI can play a crucial role in reducing costs and improving the efficiency of vaccine services, making them more affordable and accessible to a wider population.

AI can optimize the operations of healthcare facilities by automating routine tasks, such as scheduling appointments, managing patient records, and processing payments. This reduces administrative overhead and allows healthcare providers to focus on patient care, ultimately lowering the cost of providing vaccine services. Additionally, AI can analyse healthcare expenditure data to identify areas where costs can be reduced, such as minimizing vaccine wastage or optimizing staffing levels at vaccination clinics (Aji, 2023). For example, AI-driven systems can monitor vaccine usage in real-time and alert healthcare providers when stocks are running low or when vaccines are nearing their expiration date. This prevents the overordering of vaccines and reduces the risk of wastage, ensuring that resources are used efficiently. By improving the efficiency of vaccine distribution and administration, AI can help healthcare providers offer vaccines at lower prices, making them more accessible to patients from all socio-economic backgrounds.

Enhancing Vaccine Safety and Monitoring Adverse Events

Ensuring the safety of vaccines and monitoring adverse events is a critical component of protecting patients' rights in healthcare. AI can play a significant role in enhancing vaccine safety by analysing large datasets from clinical trials, healthcare records, and patient reports to detect potential safety issues or adverse reactions.

Machine learning algorithms can sift through millions of patient records to identify patterns of adverse events that may not be immediately apparent to healthcare providers. For instance, if a specific batch of vaccines is associated with a higher-than-expected rate of adverse reactions, AI can quickly flag this issue and alert health authorities, allowing for prompt investigation and corrective action. This enhances the overall safety of vaccine services and ensures that patients can trust the vaccines they receive (Santoso, 2021).

AI can also support post-vaccination monitoring by enabling real-time reporting of adverse events. Patients can use mobile apps or online platforms to report any side effects they experience after receiving a vaccine, and AI algorithms can analyse these reports to detect trends or emerging safety concerns. This continuous monitoring ensures that any potential safety issues are identified and addressed quickly, minimizing the risk to patients.

In Indonesia, where the use of unlicensed or substandard vaccines has been a concern in the past, AI-driven safety monitoring can provide an additional layer of protection for patients. By leveraging AI to monitor vaccine safety in real time, the state can ensure that only safe and effective vaccines are administered, protecting patients from potential harm.

Addressing Health Disparities through AI

One of the most significant challenges in healthcare, including vaccine services, is the existence of health disparities between different socio-economic and geographic groups. In Indonesia, patients in rural areas or from lower-income backgrounds often face barriers to accessing healthcare, including limited availability of vaccine services. AI can help address these disparities by identifying underserved populations and directing resources to areas where they are needed most.

AI algorithms can analyse healthcare data to identify gaps in vaccine coverage, highlighting regions or communities that are underserved. By using AI to map these disparities, the state can implement targeted interventions, such as mobile vaccination clinics or outreach programs, to ensure that all citizens have access to vaccine services. This can help bridge the gap between urban and rural

healthcare access, ensuring that patients in remote areas are not left behind. Furthermore, AI can support telemedicine initiatives, allowing patients in rural areas to consult with healthcare providers remotely and receive personalized advice on vaccination. This can be particularly beneficial in areas where healthcare facilities are scarce, as patients can receive guidance on where to access vaccine services and what steps to take to protect their health.

However, while AI offers tremendous potential to make healthcare more efficient and inclusive, it also presents significant risks that must be carefully managed to ensure that the technology supports, rather than undermines, human rights (ANA, 2022). One of the primary risks associated with AI is the potential for data bias. AI algorithms are only as good as the data they are trained on, and if the data is biased, the AI system may produce biased results. This is particularly problematic in healthcare, where biased algorithms could lead to unequal access to vaccines or other essential services (Zulaikha et al., 2021). For example, if an AI system is trained primarily on data from urban areas, it may not accurately predict vaccine demand in rural regions, resulting in unequal distribution. Similarly, if the training data reflects historical inequalities in healthcare access, the AI system may reinforce those inequalities, making it harder for marginalized communities to access the vaccines they need. To mitigate these risks, governments must ensure that AI systems are trained on diverse and representative datasets that accurately reflect the needs of all populations, particularly those that have historically been underserved by the healthcare system.

Introducing AI-based technology into nursing science raises public concerns and discussions, with many health workers fearing that technology will replace human interactions, violating the ethics of health services, while others fear that AI will replace the role of health workers (Stokes & Palmer, 2020). Another major concern is the ethical use of AI technology, such as managing data bias and its use to train algorithms (Robert, 2019).

Another challenge associated with AI is the need for robust data privacy protections. AI systems often rely on the collection and analysis of large amounts of personal data, including health records and vaccination histories (Fathiyana et al., 2022). Ability to adapt to change in diagnostics, therapies, and practices to maintain patient safety and patient privacy is of utmost importance in AI implementation (Rigby, 2019). This raises significant privacy concerns, particularly in countries where data protection laws are still developing. In Indonesia, the Personal Data Protection Law (Law No. 27 of 2022) provides a framework for safeguarding personal data, but its application to AI in healthcare remains underdeveloped. To protect patients' rights, the state must ensure that AI systems comply with national data protection laws and that personal health data is used responsibly and securely (Jing et al., 2021).

Transparency and accountability are also critical components of ensuring that AI supports human rights in healthcare. AI systems must be transparent in how they make decisions, and there must be mechanisms in place to hold those systems accountable when they fail or cause harm. This includes ensuring that healthcare providers understand how AI systems operate and can explain decisions to patients. Without transparency, patients may feel that they have lost control over their healthcare choices, undermining their trust in the healthcare system.

To address these challenges, governments should develop clear regulatory frameworks that govern the use of AI in healthcare. These frameworks should focus on ensuring that AI systems are used ethically and in a way that promotes equality and fairness in healthcare delivery. This includes establishing guidelines for data collection and use, ensuring transparency in AI decision-making processes, and implementing accountability mechanisms to ensure that AI systems are subject to public oversight.

CONCLUSION

The state is tasked with ensuring vaccines are accessible, safe, and affordable for all citizens, but challenges remain in addressing disparities in healthcare access. AI offers significant potential to address these challenges, optimizing vaccine distribution, improving access to information, reducing costs, and enhancing safety monitoring. By leveraging AI, states can better fulfill their responsibility to provide safe, affordable, and accessible vaccine services, ultimately protecting patients' rights and improving public health outcomes. Future research should explore the practical applications and ethical considerations of integrating AI into vaccine service delivery and healthcare accessibility, focusing on designing and regulating AI-driven tools to optimize equitable distribution, enhance patient access to comprehensive vaccine information, and ensure data privacy in line with human rights standards. This

research could guide policymakers in developing AI regulations that prioritize efficiency and equity, supporting the state's responsibility to uphold patient rights and public health.

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