Volume 4, No. 12 Desember 2025
p-ISSN 2980-4868 | e-ISSN 2980-4841
https://ajesh.ph/index.php/gp

Smart Health Payment System: Digitalization of Co-Payments Toward Efficiency and Equity in JKN Financing in Indonesia

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Keywords
Co-payment; digitalization; JKN.

Abstract
Increasing the financing burden of the National Health Insurance (JKN) requires an innovation in the financing system that is efficient, fair, and sustainable. One potential effort is the implementation of a co-payment mechanism, which is joint financing between participants and insurance providers. However, its implementation in Indonesia still faces obstacles in the form of delays in claim verification, low cost transparency, and the lack of integration of digital systems in the payment process. This article aims to analyze the idea of implementing the Smart Health Payment System, which is an integrated co-payment digitalization model to improve the efficiency and fairness of JKN financing in Indonesia. This study uses a systematic literature review approach by examining national and international scientific articles published between 2020–2025 through the PubMed, DOAJ, and BMC databases. The results of the study show that the application of digital technologies such as blockchain, artificial intelligence (AI), and real-time claim integration can speed up the administrative process, reduce the risk of fraud, and increase the accuracy and transparency of payments. In addition, the digitization of co-payment also supports social justice through adaptive contribution schemes based on participants' economic capabilities. The concept of the Smart Health Payment System has the potential to be an innovative strategy in JKN financing reform towards an efficient, transparent, and equitable national health system.

INTRODUCTION

One of the strategic plans of the Indonesian government to achieve Universal Health Coverage (UHC) is the National Health Insurance Program (JKN) (Mulyadi, 2025; Rahmawati & Hsieh, 2024; Salsabila & Trimurni, 2024; Susilo et al., 2025). Everyone is expected to have equal and affordable access to health services through the implementation of BPJS Kesehatan. However, in the process, the main problem of JKN is the imbalance between the participant's contribution income and the significant burden of health service claims. This imbalance can result in a financing deficit and delays in the payment of health facilities. This condition requires a financing system that is not only effective but also sustainable and fair.

The mechanism for sharing health service costs between participants and insurance providers is an alternative financing that can be used. Mechanisms like this can increase participants' responsibility for the use of services and help reduce the burden of BPJS Kesehatan claims. Copayments that are progressively structured based on participants' economic capabilities can strengthen the sustainability of the health insurance system without reducing access to basic services (Rahman, Gasbarro, & Alam, 2022). Therefore, copayment can be an important tool for creating an efficient and fair national health financing system.

However, the implementation of the co-payment scheme in Indonesia still faces significant challenges, such as delays in claim verification, low cost transparency, and the lack of integration of digital systems in the payment process. This condition causes administrative burdens to increase and hinder the efficiency of JKN fund management. In this context, digital technology-based innovation is needed that is able to unite the entire payment process automatically and transparently. The idea of the Smart Health Payment System was developed as an integrated co-payment digitalization model, utilizing technologies such as artificial intelligence (AI), blockchain, and real-time claim integration to speed up administration, improve verification accuracy, and ensure transparency and fairness in JKN financing in Indonesia.

The use of digital technology in the health financing system is in line with the idea of the Smart Health Payment System, which is a digital integration model that supports the transparency and effectiveness of the implementation of JKN co-payment. Every payment transaction between participants, health facilities, and insurance providers can be recorded automatically through this system. Health system resilience means the ability of the health system to withstand financing pressures and operational issues without losing its function (Copeland et al., 2023). In addition, this idea encourages JKN financing reform towards a responsible, fair, and resilient system (Al Asfoor et al., 2024).

The urgency of this research stems from the pressing need to address JKN's financial sustainability crisis. Without innovative solutions, the deficit may worsen, potentially undermining UHC achievements. The COVID-19 pandemic has further highlighted the importance of resilient health financing systems capable of withstanding fiscal pressures while maintaining service continuity (Copeland et al., 2023; Asfoor et al., 2024). Therefore, this study addresses the gap by proposing a concrete, evidence-based digital model tailored to Indonesia's unique socio-economic and infrastructural context.

The novelty of this research lies in its comprehensive integration of three digital technologies—AI, blockchain, and real-time claims processing—into a unified co-payment system specifically designed for JKN. Unlike previous studies that examined these technologies separately, this research synthesizes them into a practical framework called the Smart Health Payment System, operationalized through the "Smart Health Pay" application. This represents an original contribution to health financing literature, particularly for lower-middle-income countries pursuing UHC.

Therefore, this study focuses on the ideas of the Smart Health Payment System as a model for digitizing co-payment that can improve the efficiency, transparency, and fairness of JKN financing. It is hoped that this system will support the financial sustainability of JKN and strengthen the principle of social justice in health financing in Indonesia.

METHOD

This research was prepared using a literature review method with a systematic approach to examine various national and international research that discusses the digitalization of the health financing system and the implementation of co-payment mechanisms in the National Health

Insurance (JKN) program. This approach was chosen because it can provide a comprehensive understanding of the development of the concept, the results of previous research, and opportunities for the implementation of the Smart Health Payment System model in Indonesia as a form of efficient and equitable financing innovation.

Article searches were conducted on several scientific databases, namely PubMed, DOAJ, and BMC, with a publication period of 2020–2025. The search process used a combination of keywords "co-payment," "digital health financing," "blockchain," "artificial intelligence," and "JKN Indonesia." From the initial search results, the selected articles must meet the inclusion criteria, namely discussing the digitization of health financing, have a relationship with cost-sharing or co-payment mechanisms, be published in peer-reviewed journals, and be available in open access. Articles that are irrelevant, do not contain empirical data, or are only opinions are excluded from the analysis.

All selected articles were then analyzed using a descriptive thematic approach, namely by grouping research results based on the main issues that emerged. For example, research by Adzakpah & Dwomoh (2023) that shows the efficiency of digital systems against reducing claims rejection rates, Ramezani et al. (2023) that explains the role of artificial intelligence in optimizing healthcare financing, and Bathula et al. (2024) that highlights the integration of blockchain to maintain data security and transaction transparency. This approach also considers the aspects of health system resilience discussed by Copeland et al. (2023) as well as the implications of social justice in the digitalization of financing as described by Oranje & Mathauer (2024).

The synthesis process was carried out by examining the relationship between administrative efficiency, transparency of fund management, and social justice in the implementation of digital payment systems. Findings from various literature are presented in the form of narratives that describe the opportunities, benefits, and challenges in the implementation of the Smart Health Payment System in the JKN scheme in Indonesia. Thus, this method allows researchers to compile up-to-date evidence-based analyses that are relevant with the aim of realizing an efficient, adaptive, and equitable health financing system.

RESULTS AND DISCUSSION

Based on the results of a literature search using the systematic literature review approach, 14 scientific studies were found that were relevant to the topics of digitizing the health financing system, reforming public financial governance, and strengthening the national health insurance system. The fourteen studies provide a consistent picture that the application of digital technologies, such as Artificial Intelligence (AI), blockchain, and real-time-based claims integration, play an important role in improving administrative efficiency, speeding up the claims process, and strengthening the transparency and accountability of the health financing system.

Table 1. Summary of Research Results Related to Financing and Health System Digitalization

No	Name of Researcher and Year	Research Title	Research Results	Journal Conclusion
1	Adzakpah, G., & Dwomoh, D. (2023)	*Impact of digital health technology on health insurance claims rejection rate in Ghana: a quasi-experimental study.*	The use of digital technology in the insurance claims system reduces the claim rejection rate by 35% and speeds up the process of verifying participant data.	The digitization of the claims system increases administrative efficiency and strengthens participants' trust in insurance providers.
2	Asfoor, A. et al. (2024)	*Concept analysis of health system resilience.*	The resilience of the health system depends on the adaptive ability and integration of digital technology in financing and health services.	Increasing the resilience of health systems requires digital innovations that strengthen financing capacity and crisis response.
3	Azizatunnisa, L., Kuper, H., & Banks, L. M. (2024)	*Access to health insurance amongst people with disabilities and its association with healthcare use and financial protection in LMICs: a systematic review.*	People with disabilities still face financial barriers and access to insurance in lower-middle-income countries.	Digitization and integration of social data are needed to ensure equitable access to health financing for people

No	Name of Researcher and Year	Research Title	Research Results	Journal Conclusion
				with disabilities.
4	Bathula, A. et al. (2024)	*Blockchain, artificial intelligence, and healthcare: the tripod of future — a narrative review.*	The combination of AI and blockchain improves data security and payment process efficiency in the healthcare system.	The integration of AI and blockchain has the potential to transform the healthcare payment system to be more transparent, fast, and secure.
5	Copeland, S. et al. (2023)	*A resilience view on health system resilience: a scoping review of empirical studies and reviews.*	Cross-sector coordination factors and digital innovations have been proven to strengthen the health system's ability to maintain service continuity.	Financing digitalization supports the resilience of the health system, especially in the face of fiscal burdens and service crises.
6	Lim, M. Y. et al. (2023)	*Health financing challenges in Southeast Asian countries for universal health coverage: a systematic review.*	ASEAN countries face the problem of financing inequality and the limitations of the health payment	Policy reform and digital transformation of financing are needed to achieve

No	Name of Researcher and Year	Research Title	Research Results	Journal Conclusion
			digitalization system.	universal health coverage in Southeast Asia.
7	Nguyen, K. et al. (2024)	*Cashing in: cost-benefit analysis framework for digital hospitals.*	Digital hospitals have been proven to increase operational cost efficiency and accelerate patient service.	Digital systems provide high economic value for healthcare institutions through cost efficiency and service time.
8	Oranje, M., & Mathauer, I. (2024)	*Exploring the effects of digital technologies in health financing for universal health coverage: a synthesis.*	The use of digital technology in the financing system increases the transparency and efficiency of public fund flows.	Digitization of financing is an important element in strengthening the fairness and accountability of the national health system.
9	Pioch, C. et al. (2024)	*Digital technologies for health financing in low- and middle-income countries: a scoping review protocol.*	Research shows the great potential of digital technology to speed up claims and reduce administrative burden in	Digital financing strengthens a health financing system that is inclusive and

No	Name of Researcher and Year	Research Title	Research Results	Journal Conclusion
			developing countries.	adaptive to the needs of low-income communities.
10	Rahman, T. et al. (2022)	*Financial risk protection from out-of-pocket health spending in LMICs: a scoping review.*	Direct spending (OOP) is still the main cause of financial risks in lower-middle-income countries.	Digital-based financing mechanisms can expand financial protection and reduce inequality in access to health services.
11	Ramezani, M. et al. (2023)	*The application of artificial intelligence in health financing: a scoping review.*	AI can be used to predict claims patterns, prevent fraud, and optimize the distribution of health funds.	AI is an important innovation in building an efficient and accountable health financing system.
12	Schuetze, L. et al. (2023)	*What factors explain low adoption of digital technologies for health financing in an insurance setting?*	The main obstacle to the adoption of financing digitalization is the lack of digital literacy and supporting infrastructure.	Digital capacity building and technology investment are needed to expand the

No	Name of Researcher and Year	Research Title	Research Results	Journal Conclusion
				implementation of digital-based financing systems.
13	Teixeira, N. et al. (2022)	*The economics of healthcare access: a scoping review on the economic impact of healthcare access for vulnerable urban populations in LMICs.*	Vulnerable communities in urban areas face significant economic barriers to access to health services.	Adaptive and digital financing systems are needed to ensure that vulnerable groups have equal access and financial protection.
14	Walsan, R. et al. (2023)	*Is there an association between out-of-pocket hospital costs, quality and care outcomes? A systematic review of contemporary evidence.*	High hospital costs correlate with decreased service quality and patient health outcomes.	A transparent and digital-based financing system can reduce patients' personal expenses and improve service quality.

One of the major advances in digital-based health financing transformation is increasing efficiency, transparency, and fairness in the management of health insurance funds. Classic problems in the implementation of National Health Insurance (JKN) such as late claims, synchronous manual verification, and potential inaccuracies in financial reporting can be overcome by implementing an integrated digital system.

The results of the fourteen studies show that the use of digital technology can speed up data verification, reduce the risk of claim rejection, and optimize the distribution of funds in a more transparent way. Research by Adzakpah & Dwomoh (2023) proves that the use of digital systems

in insurance claims reduces the claim rejection rate by 35%. Bathula et al. (2024) and Ramezani et al. (2023) reinforce the evidence that the integration of Artificial Intelligence (AI) and blockchain is capable of accelerating claim validation while protecting financial data from the risk of manipulation.

Meanwhile, research by Oranje & Mathauer (2024) confirms that digital systems not only have an impact on efficiency, but also strengthen social justice in health financing. Digitalization allows for adaptive co-payments that can be adjusted to the economic conditions of participants, so that low-income groups remain financially protected. In the Indonesian context, this concept is relevant to strengthen the financial sustainability of JKN without sacrificing the principle of equal distribution of services.

These findings are the basis for the development of the Smart Health Payment System concept, which is a digital-based smart health payment system that is integrated between patient medical record data of BPJS users, payment data, and JKN claim management. The system is designed to speed up administrative processes, strengthen accountability, and ensure financing fairness through technological innovation.

To realize this concept in real life, a digital application called "Smart Health Pay" was designed as a form of concrete implementation of the Smart Health Payment System. This application is a digital platform that bridges BPJS participants, health facilities, and BPJS Kesehatan in one interconnected data ecosystem.

Through automatic integration, every service received by the patient will be directly recorded in the electronic medical record system (RME) and connected to the BPJS server. Artificial Intelligence (AI) is used to verify the suitability between medical diagnoses, actions, and the amount of claim rates. Furthermore, the system calculates the value of claims and co-payments of participants based on the class of membership and level of economic ability, which is taken from the Integrated Social Welfare Data (DTKS) data. All these transactions are then permanently recorded through the blockchain ledger so that they cannot be manipulated and can be audited openly by BPJS and the Ministry of Health.

In addition, the Smart Health Pay application provides a national analytics dashboard that can monitor claims status, budget projections, and distribution of health facility payments in real-time. Thus, this system not only brings together medical and financial data, but also supports data-driven policies to strengthen JKN financing governance.

A summary of empirical findings can be seen in the following table:

Table 2. Conceptual Ideas of Smart Health Payment System

System Components	Implementation Strategy	Objectives and Impact
Digitization of the Claims Process	Implementation of real-time-based automatic verification between health facilities and BPJS	Speed up the claims process and reduce administrative burden

System Components	Implementation Strategy	Objectives and Impact
Smart Co-Payment	Adjustment of co-payments based on income level and type of service	Ensuring financial fairness between participants
AI and Blockchain	Use of digital audit algorithms and unreasonable claim detection	Increase transparency and prevent misuse of funds
System Interoperability	Integration of financial data across regions through a single national portal	Unifying JKN reports and fund flows
Social Protection Policy	Setting the maximum out-of-pocket limit and subsidies for vulnerable participants	Reduce financial risk and increase inclusion

Source: results of concept development based on literature in 2022–2024.

Overall, the implementation of the Smart Health Payment System through the Smart Health Pay application is a strategic step in JKN financing reform. The system is able to connect all the key dimensions of medical, financial, and social financing in one integrated digital mechanism that is efficient and transparent. With the support of public policies and adequate digital infrastructure, this concept has the potential to realize an efficient, fair, and sustainable national health financing system, while strengthening public accountability in the post-pandemic era of digitization of health administration.

CONCLUSION

The Smart Health Payment System represents a strategic approach to enhancing the efficiency, transparency, and accountability of the National Health Insurance (JKN) system through the integration of technologies such as artificial intelligence (AI), blockchain, and real-time claims processing. This digital innovation accelerates verification and payment processes, improves accuracy and security, reduces fraud risks, and strengthens public trust in national health fund management. Furthermore, it promotes an adaptive co-payment mechanism that aligns participants' contributions with their economic capacity, thereby supporting equity without limiting access to essential health services. Implemented through the "Smart Health Pay" application, this system has the potential to reinforce JKN's financial sustainability and serve as a model for post-pandemic health financing reform, provided it is supported by strong public policy, robust digital infrastructure, and improved technological literacy. Future research should focus on empirical evaluation of system implementation, including its impact on cost efficiency, user acceptance, data security, and health equity outcomes across different socioeconomic groups.

REFERENCES

Adzakpah, G., & Dwomoh, D. (2023). Impact of digital health technology on health insurance claims rejection rate in Ghana : a quasi - experimental study. BMC Digital Health, 3, 1–13.

https://doi.org/10.1186/s44247-023-00006-3
Asfoor, A., Asfoor, D. Al, Tabche, C., Zadjali, M. Al, Mataria, A., Saikat, S., & Rawaf, S. (2024). Concept analysis of health system resilience. Health Research Policy and Systems, 1–10. https://doi.org/10.1186/s12961-024-01114-w
Azizatunnisa, L., Kuper, H., & Banks, L. M. (2024). Access to health insurance amongst people with disabilities and its association with healthcare use , health status and financial protection in low- and middle-income countries : a systematic review. International Journal for Equity in Health. https://doi.org/10.1186/s12939-024-02339-5
Bathula, A., Gupta, S. K., Merugu, S., & Saba, L. (2024). Blockchain , artificial intelligence , and healthcare : the tripod of future — a narrative review. In Artificial Intelligence Review (Vol. 57, Issue 9). Springer Netherlands. https://doi.org/10.1007/s10462-024-10873-5
Copeland, S., Krapels, S. H., Fecondo, F., Santizo, E. R., Bal, R., & Comes, T. (2023). A resilience view on health system resilience : a scoping review of empirical studies and reviews. BMC Health Services Research, 8, 1–19. https://doi.org/10.1186/s12913-023-10022-8
Lim, M. Y., Kamaruzaman, H. F., Wu, O., & Geue, C. (2023). Health financing challenges in Southeast Asian countries for universal health coverage : a systematic review. 1–12.
Mulyadi, B. (2025). Universal Health Coverage Acceleration Through the UHC Village Approach: The (Supporting Universal Health Coverage So Express and Sustainable (SUCSES) Innovation in Indonesia's in National Health Insurance Program. *Miracle Get Journal*, *2*(3), 101–111.
Nguyen, K., Comans, T., Nguyen, T. T., Simpson, D., Woods, L., Wright, C., Green, D., Mcneil, K., & Sullivan, C. (2024). Cashing in : cost-benefit analysis framework for digital hospitals. Also Read: 7:1–12.
Oranje, M., & Mathauer, I. (2024). Exploring the effects of digital technologies in health financing for universal health coverage : a synthesis. June.
Pioch, C., Struckmann, V., Brikci, N., Allegri, M. De, Emmrich, J. V., Knauss, S., Mathauer, I., Opoku, D., & Quentin, W. (2024). Digital technologies for health financing in low- income and middle- income countries : a scoping review protocol. 1–6. https://doi.org/10.1136/bmjopen-2023-080132
Rahman, T., Gasbarro, D., & Alam, K. (2022). Financial risk protection from out - of - pocket health spending in low - and middle - income countries : a scoping review of the literature. Health Research Policy and Systems, 1–23. https://doi.org/10.1186/s12961-022-00886-3
Rahmawati, T., & Hsieh, H.-M. (2024). Appraisal of universal health insurance and maternal health services utilization: pre-and post-context of the Jaminan Kesehatan Nasional implementation in Indonesia. *Frontiers in Public Health*, *12*, 1301421.
Ramezani, M., Takian, A., Bakhtiari, A., Rabiee, H. R., Fazaeli, A. A., & Sazgarnejad, S. (2023). The application of artificial intelligence in health financing : a scoping review. That is why we need to be vigilant, and we need to be vigilant.
Salsabila, G., & Trimurni, F. (2024). The Universal Health Coverage Program of Medan Blessing Health Insurance (UHC JKMB) to Improve Public Health Services in Medan City from a

Regional Autonomy Perspective. *Administratio*, *15*(2), 51–69.

Schuetze, L., Srivastava, S., Kuunibe, N., & Rwezaula, E. J. (2023). Original Article What Factors Explain Low Adoption of Digital Technologies for Health Financing in an Insurance Setting ? Novel Evidence From a Quantitative Panel Study on IMIS in. https://doi.org/10.34172/ijhpm.2023.6896

Susilo, D., Lila, W. L. P., Sukmayeti, E., Asante, A., Jan, S., Thabrany, H., Tangcharoensathien, V., Wiseman, V., & Liverani, M. (2025). Can Indonesia achieve universal health coverage? Organisational and financing challenges in implementing the national health insurance system. *SSM-Health Systems*, 100138.

Teixeira, N., Filha, D. S., Li, J., Howard, P. A. P., Quayyum, Z., Kibuchi, E., Mithu, I. H., Vidyasagaran, A., Sai, V., Manzoor, F., Tolhurst, R., Mazumdar, S., Rosu, L., Garimella, S., & Elsey, H. (2022). The economics of healthcare access : a scoping review on the economic impact of healthcare access for vulnerable urban populations in low - and middle - income countries. 1–25. https://doi.org/10.1186/s12939-022-01804-3

Walsan, R., Mitchell, R. J., Braithwaite, J., Westbrook, J., Hibbert, P., Mumford, V., & Harrison, R. (2023). Is there an association between out - of - pocket hospital costs , quality and care outcomes ? A systematic review of contemporary evidence. BMC Health Services Research, 1–13. https://doi.org/10.1186/s12913-023-09941-3