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Optimization Of Data Interoperability Between Simrs And The JKN Mobile Application As An Effort To Digital Transform Health Services At Welas Asih Regional Hospital

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ABSTRACT

Digital transformation in Indonesia's healthcare sector is increasingly developing through the implementation of information system integration that supports accelerated service delivery, particularly in healthcare facilities with high visitor loads. This study analyzes the dynamics of interoperability between the Hospital Management Information System (SIMRS) and the JKN Mobile application in the patient registration process at Welas Asih Regional Hospital, a hospital with approximately 2,000 daily visits, of which approximately 1,500 use JKN Mobile. This study used a qualitative approach with a case study design, through in-depth interviews and direct observation of the registration process. The results indicate that the SIMRS–JKN Mobile integration is effective when the system is functioning normally, characterized by a fast barcode check-in process, automatic queue number synchronization without re-input, and consistent receipt number locking across all service stages up to claims. However, several obstacles still arise, particularly BPJS server disruptions, internet network instability, GPS reading issues, and limited patient digital literacy. Staff overcome these obstacles through adaptive strategies such as GPS calibration, switching to the hospital's Wi-Fi network, arrival time validation, and the use of the SIMRS approval feature. This study demonstrates that successful interoperability is determined not only by technological readiness but also by organizational readiness, staff operational competence, and patient capability in using digital applications. These findings provide a novel scientific contribution by providing comprehensive field evidence on the implementation of interoperability in high-volume healthcare facilities and providing recommendations for technical improvements and service governance for hospitals and policymakers.

Keywords: interoperability; SIMRS; JKN Mobile; digital transformation;

INTRODUCTION

Digital transformation is a priority agenda in Indonesia's healthcare sector, in line with the Ministry of Health's Digital Health Transformation Roadmap and the strengthening of the National Health Insurance (JKN) service system by the National Health Insurance Agency (BPJS Kesehatan). The Ministry of Health emphasizes national interoperability standards through information system integration, standardization of electronic medical records, and the use of a centralized data platform (Kemenkes RI, 2021). At the same time, BPJS

Kesehatan continues to promote the optimization of JKN Mobile as the primary channel for participant services, including self-registration and digital queues.

The Hospital Management Information System (SIMRS) plays a crucial role in improving operational efficiency, reducing administrative burdens, and improving data accuracy. Recent research has shown that SIMRS can speed up service flows and reduce queues through administrative automation (Susanti et al., 2025; Haryanto et al., 2024). Integrating SIMRS with the JKN Mobile application is increasingly relevant, as this application has become a primary requirement for patients accessing digital healthcare services (Ramdanis & Priyambodo, 2025; Kusuma et al., 2025).

However, various interoperability challenges remain in healthcare facilities, including BPJS server disruptions, internet network instability, differences in data standards, and user-facing challenges such as account verification and device limitations (Nainggolan et al., 2025; Panjaitan et al., 2024; Siregar et al., 2024). Furthermore, a research gap exists as few studies have explored the operational dynamics of SIMRS–JKN Mobile integration in hospitals with high patient volumes.

Welas Asih Regional Hospital (RSUD Welas Asih) is a relevant context because it serves approximately 2,000 patients per day, with approximately 90% using JKN Mobile. The SIMRS used at this hospital was also independently developed by the internal IT team, providing flexibility for system integration with JKN Mobile.

This study attempts to fill this research gap by deeply analyzing the SIMRS–JKN Mobile interoperability in the patient registration process, including effectiveness, technical barriers, digital literacy, and adaptive strategies of officers in dealing with system disruptions.

METHODS

This study used a qualitative approach with a case study design to examine the operational experience of SIMRS–JKN Mobile integration in the patient registration process at Welas Asih Regional Hospital. This approach was chosen because it allows for in-depth exploration of the phenomenon in its original context, as described by Sugiyono (2019). The study was conducted in November 2025 in the outpatient area, where researchers observed the patient arrival flow, barcode check-in process, staff-patient interactions, and the handling of emerging technical issues.

Data were collected through in-depth interviews with registration officers responsible for the SIMRS–JKN Mobile integration and field observations during operating hours. The interviews were semi-structured, recorded with the informant's consent, and focused on understanding the bridging mechanism, network stability, JKN Mobile server disruptions, GPS issues, and account verification challenges. Observations were conducted to confirm the interview information and understand the officers' actual responses to disruptions.

Data analysis was conducted using thematic analysis techniques, beginning with open coding to identify units of meaning, followed by axial coding to develop categories, and ending with selective coding to formulate core themes regarding the dynamics of system interoperability. Data validity was ensured through interview-observation triangulation and direct clarification

with informants. The entire research process adhered to qualitative ethical principles, including confidentiality and the use of recordings solely for analytical purposes.
This research uses a qualitative approach with a case study design to understand the dynamics of interoperability in a real-life operational context. This method was chosen because it allows for in-depth exploration of processes, interactions, and user experiences (Sugiyono, 2019).
Examples of interview quotes used in the analysis:
"If the system is working properly, patients can see a doctor in at most an hour. If JKN Mobile is down, it can take more than two hours because the queue is blocked."
"Often, the patient's phone doesn't support it or its GPS can't be detected. We usually try turning the GPS on and off. If that still doesn't work, we use the SIMRS approval."
Data were analyzed using thematic analysis, including open, axial, and selective coding. Validity was maintained through technical triangulation and confirmation with informants.

RESULTS

The study results show that Welas Asih Regional Hospital, a healthcare facility with a high patient load—reaching approximately 2,000 patients per day—relies significantly on the use of JKN Mobile in its registration administration process. Of these total daily visits, approximately 1,500 patients (±90%) are active JKN Mobile users, making the integration between SIMRS and JKN Mobile a crucial component in maintaining a smooth service flow.
In general, interoperability works well when the BPJS system and internet network are stable. The barcode check-in process on JKN Mobile can be completed in seconds, and patient queue numbers are automatically synchronized to the SIMRS without requiring re-entry by staff. The SIMRS receipt number locking feature also ensures that patient identity and registration data remain consistent throughout the doctor's examination and BPJS claims process. This demonstrates that the integration of the two systems has supported administrative efficiency and minimized the potential for data duplication or inaccuracy.
However, the study also identified a number of frequently occurring technical challenges. One major obstacle was a BPJS server downtime, which prevented patients from checking in via the app even though they were already at the hospital. When this occurred, service delivery experienced significant delays. Waiting times, which were typically around one hour from arrival to seeing a doctor, could increase to more than two hours. Officials reported that queues often occurred because the queue list from JKN Mobile was not read or entered into the SIMRS.
Besides the BPJS server, the instability of the hospital's internet network also impacts the process. During peak hours, especially in the morning, the system can run slower, causing queue synchronization delays. Other obstacles arise from the patient's perspective, such as mobile devices that don't support JKN Mobile, GPS that can't be read, or the inability to use the OTP code verification feature, email, or WhatsApp. Staff confirmed that user issues are the most common obstacle encountered in using JKN Mobile.

To address these challenges, registration staff implemented a multi-step adaptive solution. If a patient's GPS was not detected, staff instructed them to turn the location off and back on or move to a more open area. When these efforts were unsuccessful, staff utilized the approval feature in the Hospital Management Information System (SIMRS), which allows them to manually validate patient arrivals. This feature is crucial because approval reports are automatically recorded and forwarded to BPJS Kesehatan (Social Security Agency), ensuring the validity of claims is not compromised. Staff also directed patients to switch to the hospital's Wi-Fi network for a more stable check-in process.

Based on observations, the SIMRS implementation developed by the internal IT team at Welas Asih Regional Hospital provides high flexibility in the integration process. This is reflected in the system's ability to adapt to manual approval processes, queue tracking, and patient check-in recording. The internal system's adaptive capabilities allow the hospital to maintain service continuity even when the external system (BPJS) experiences disruptions.

These findings demonstrate that SIMRS–JKN Mobile interoperability offers significant benefits for service efficiency, but its success depends heavily on infrastructure readiness, the stability of BPJS national services, and user digital literacy. With such a high user volume, even minor system or patient device issues can significantly impact the overall service flow.

DISCUSSION

The integration of SIMRS and JKN Mobile at Welas Asih Regional Hospital demonstrates how interoperability can accelerate administrative processes while supporting improved service quality. When the system is operating normally, the registration process is highly efficient: patients simply scan the barcode on the JKN Mobile app, after which the data is automatically synchronized with SIMRS, the queue number is recorded without manual input, and the receipt number is locked until the claim process. These field findings align with recent literature confirming that digitizing administration through mobile apps can accelerate service flows, reduce queues, and minimize data duplication (Ramdanis & Priyambodo, 2025; Kusuma et al., 2025). Research at various community health centers and hospitals in Indonesia also shows that the JKN Mobile app has a significant impact on operational efficiency and perceived service quality (Nainggolan et al., 2025; Panjaitan et al., 2024).

In the context of Welas Asih Regional Hospital, the effectiveness of interoperability is increasingly evident in the high number of app users, accounting for approximately 90 percent of the total 2,000 daily patient visits. This figure is significantly higher than the national average, which still retains a large proportion of in-person service users. This high adoption presents both pressure and opportunity for the hospital, as the large volume of digital transactions helps expedite service flows but also increases the risk of system disruptions.

Although the system performs optimally under normal circumstances, several significant barriers affect interoperability. BPJS server disruptions are the most common obstacle, followed by internet network instability and GPS location inconsistencies on patient devices. When disruptions occur, service duration can increase dramatically, from a waiting time of around one hour under normal conditions to over two hours. This finding aligns with previous

research reports showing that successful JKN Mobile adoption is highly dependent on network quality and national server stability (Ramadani et al., 2023; Hartanto et al., 2025). Issues with account verification, such as delayed or failed OTPs, have also been identified as a barrier in several studies, particularly for users with low digital literacy or incompatible devices (Pratama & Suhartanto, 2025; Siregar et al., 2024).

From a user perspective, digital literacy is a determining factor in the application's effectiveness. Many patients experience difficulty activating location, updating the application, or completing the account verification process. This is consistent with research by Qahar et al. (2024), which found that the JKN Mobile user experience is significantly influenced by the complexity of the features and the user's ability to operate them. In the field, staff often have to assist patients with GPS calibration or connecting devices to the hospital's Wi-Fi network. When these efforts are unsuccessful, staff utilize the approval feature in the Hospital Management Information System (SIMRS), which allows patients to remain registered even if digital check-in fails. This procedure is a crucial example of staff's adaptive strategies to maintain service continuity.

The adaptations made by staff demonstrate that interoperability relies not only on the compatibility of systems and devices, but also on the capabilities of the human actors involved. These findings reinforce the literature emphasizing that successful digital transformation in the healthcare sector is impossible without adequate technical support, human resource training, and clear workflows (Firdayanti & Hajad, 2025; Damanik et al., 2024). In the context of Welas Asih Regional Hospital, the staff's ability to resolve technical disruptions is a key factor in ensuring service continuity. Human intervention—despite the system's automation—remains a dominant role in bridging gaps that technology cannot fully address.

In addition to technical factors and human resource competency, infrastructure readiness is a fundamental component in ensuring successful interoperability. Hospitals with independent information systems, such as the SIMRS developed by the Welas Asih Regional Hospital IT team, have greater flexibility in system integration, customization, and maintenance. This provides an advantage over healthcare facilities that still use less integrated vendor systems. However, integration remains dependent on the stability of BPJS's external servers—a dependency also identified as a barrier in other studies related to JKN Mobile (Lusiani & Princes, 2024; Putri & Sukawan, 2025).

Overall, the findings of this study confirm that successful SIMRS and JKN Mobile interoperability requires a balance between technological readiness, staff operational skills, patient digital literacy, and consistent national policy support. The Ministry of Health's digital transformation policy and BPJS's efforts to improve application performance provide structural support, but technical implementation on the ground still determines the quality of the patient experience. This study is an important contribution to the literature because it provides a detailed picture of the technical and non-technical dynamics in high-burden healthcare facilities—a context rarely highlighted in research on healthcare digitalization in Indonesia. The results also demonstrate that continuous improvements, including strengthening infrastructure, increasing staff capacity, and simplifying application interfaces,

are necessary steps to ensure the benefits of digitalization are shared equitably.

CONCLUSION

This study confirms that SIMRS–JKN Mobile interoperability at Welas Asih Regional Hospital significantly benefits the acceleration of patient registration services. System integration allows for faster check-in, reduces queues, and ensures data consistency across all stages of care. In hospitals with high JKN Mobile usage, the system's stable operation is crucial for patient experience and staff effectiveness.

Despite this, the study results indicate that various technical barriers continue to disrupt interoperability, particularly disruptions to the JKN Mobile server, internet network instability, and device and digital literacy issues for patients. These conditions have led to increased wait times and increased staff workloads. While the adaptive strategies implemented by staff have proven effective in maintaining service continuity, systemic improvements are needed at the infrastructure level, integration governance, and user education.

This research contributes to the growing literature on digital healthcare interoperability in high-volume facilities. Recommendations focus on improving the stability of the national BPJS system, strengthening the hospital network, simplifying the account verification process, and developing ongoing training for staff. With policy support and continuous improvement, the SIMRS–JKN Mobile integration has the potential to become an effective and widely replicable digital service model.

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