

# Optimization of Outpatient Administrative Workflow in the Digital Era: A Comparative Analysis of Registration Waiting Times via the Mobile JKN Application vs. On-Site Registration

Antik Pujihastuti<sup>1\*</sup>, & Mila Sari<sup>2</sup>

<sup>1</sup>\*STIKes Mitra Husada Karanganyar, Indonesia, <sup>2</sup>STIKES Dharma Landbouw Padang, Indonesia

\*Co e-mail: [att2a2000@yahoo.com](mailto:att2a2000@yahoo.com)<sup>1</sup>

## Article Information

Received: January 03, 2025

Revised: January 17, 2025

Online: February 20, 2025

## Keywords

Healthcare Digitalization, Outpatient Registration, Waiting Time, Mobile JKN, Operational Efficiency, Queuing Theory.

## ABSTRACT

*The digitalization of healthcare is crucial for improving service efficiency, a necessity highlighted by administrative burdens in Indonesia's JKN-KIS program causing long patient waiting times. This study addresses the need for quantitative evidence by comparing the operational efficiency of Mobile JKN application (Digital Pathway) versus conventional on-site registration (Physical Pathway). Using an ex-post facto quantitative comparative design on aggregated secondary RWT data from official health reports (2020–2025; N=170,995), the analysis employed the non-parametric Mann-Whitney U Test. Results showed a statistically significant difference ( $p < 0.001$ ), with the Mobile JKN RWT averaging 5.38 minutes compared to 18.91 minutes for the on-site method. This represents a substantial efficiency gain, quantified by a very large effect size (Cohen's  $d = 3.15$ ). The findings validate Mobile JKN as an effective parallel service channel for mitigating system bottlenecks. Implications include justifying health policy mandates for digital adoption and supporting the revision of Minimum Service Standards. Future research should focus on end-to-end service time analysis and sustained digital adoption drivers.*

**Keywords:** Healthcare Digitalization, Outpatient Registration, Waiting Time, Mobile JKN, Operational Efficiency, Queuing Theory.

## INTRODUCTION

The drive toward digital transformation has emerged as a fundamental necessity within contemporary global healthcare frameworks, primarily motivated by the need to significantly bolster service efficiency, patient safety, and overall accessibility. This technological shift is a critical imperative, as affirmed by Kvedar et al. (2020) in their detailed roadmap for the next decade of healthcare. Within the Indonesian context, which operates the world's most extensive public health insurance program, JKN-KIS, the immense volume of outpatient demand presents considerable administrative difficulties. These difficulties frequently manifest as extended patient waiting periods for registration, which in turn have a detrimental effect on patient contentment, increase operating expenses, and degrade the perceived quality of healthcare provision (Sun and Zhang, 2021). Recent empirical evidence from comparative analyses in tertiary hospitals also highlights how digital registration systems significantly streamline outpatient workflows and enhance access efficiency (Ranjan et al., 2025).



This work is licensed under a [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/)

**Journal of Health Service Administration and Hospital Management (LACERI)**

Vol. 01, No. 1, January 2025

---

The well-recognized administrative sluggishness in public hospitals poses a significant practical barrier to achieving universal health coverage goals. From a theoretical perspective, this problem is directly linked to the tenets of queuing theory and the imperative to optimize service delivery processes. The theoretical foundation established by Gomez-Sempere et al. (2022) confirms that when service capacity fails to align with demand volume, it invariably results in systemic bottlenecks, thus requiring a carefully planned technological intervention capable of fundamentally restructuring the clinical patient flow.

The systemic challenge of waiting times has been met with the introduction of various e-health initiatives. A pivotal development in Indonesia has been the widespread launch and promotion of the Mobile JKN application, an integrated platform that includes functionalities for advance appointment booking and administrative registration (BPJS Kesehatan, 2023). Contemporary academic literature overwhelmingly supports the contention that digital self-service platforms substantially alleviate administrative workload. Empirical research, for instance, confirms a direct relationship between implementing online registration systems and reducing administrative personnel duties (Muniandy et al., 2024). Furthermore, the global COVID-19 pandemic dramatically accelerated the adoption of these digital instruments, underscoring their critical function in regulating patient flow and minimizing physical interactions (Dutta and Roy, 2021).

Despite these established benefits, a thorough evaluation of existing research reveals a notable limitation. While numerous studies successfully document the perceived advantages and uptake rates of digital healthcare tools, few have conducted a rigorous, quantitative comparative analysis of the single most critical measurable outcome: the average waiting time for patient registration across the Mobile JKN digital pathway versus the standard conventional on-site method. Although previous work explored patient satisfaction concerning digital interfaces (Saryono et al., 2022), the specific, empirical measurement of the waiting time difference as a primary metric of operational efficiency remains largely unaddressed. Consequently, the current academic discourse lacks the robust, statistical evidence necessary to definitively support major policy decisions concerning the investment in, and mandatory use of, digital registration systems based solely on demonstrated time-saving metrics.

The central vacuum in the existing scholarly literature is the clear absence of empirical, data-driven evidence that directly compares the effectiveness of the two distinct administrative pathways: the digital pathway (Mobile JKN registration) and the physical pathway (on-site, manual registration). Previous findings concur on the theoretical benefits of digital systems, but they fail to furnish the quantified metrics of actual time savings data which is absolutely essential for hospital management and health policy determination, especially for process optimization modeling (Khasawneh et al., 2023).

This current study is designed to bridge this crucial gap by performing a direct, statistical comparison of the registration waiting times for both methods using verifiable, official national-level data. The findings will establish a clear, objective measure of the workflow optimization achieved via the Mobile JKN application, thus validating and extending the conclusions of earlier research.

This research is uniquely contributed by providing the first rigorous quantitative assessment comparing the two key national outpatient registration pathways using large-scale, authoritative secondary data to establish an objective performance benchmark for time-saving efficiency.

Arising from the identified research gap, this investigation seeks to answer the following core question:

"Does a statistically significant difference exist in the average waiting time for outpatient registration between patients who utilize the Mobile JKN application and those who use the conventional on-site registration method within the Indonesian public health system?"

The primary goals of this study are: a. To statistically compare the average registration waiting time for outpatient services between the Mobile JKN digital method and the standard on-site registration procedure, utilizing national-level secondary data. b. To quantify the precise gain in administrative efficiency (measured



by time saved) that can be directly attributed to the implementation of the Mobile JKN application. c. To determine the critical factors, beyond the method of registration itself, that influence variations in waiting times, thus providing a basis for informed future policy and system design improvements.

## **METHODS**

The description of the research methodology detailed in this section is structured with supporting references to ensure both scientific acceptability and replicability (Kothari, 2020). The publication of this manuscript confirms that all relevant materials and data protocols, sourced from public records, are available for review.

### **1. Research Design, Data Sources, and Collection**

#### **a. Research Design**

This study employs an ex-post facto quantitative comparative research design, leveraging existing secondary data (Kothari, 2020). This methodological approach is inherently non-experimental since the intervention (the Mobile JKN application) had already been rolled out. Consequently, the research involves retrospectively analyzing historical data from two pre-established patient cohorts: those who completed registration using the Mobile JKN application and those who utilized the conventional on-site method. The core analytical focus is the comparison of a specific outcome variable the patient waiting time for registration between these two naturally occurring groups (Creswell & Creswell, 2018).

#### **b. Data Sources and Type**

The data utilized in this investigation is secondary and quantitative, systematically gathered from official, publicly released reports disseminated by the relevant Indonesian governmental and non-governmental health authorities.

**Official Sources:** Data acquisition centered on published JKN Program Statistical Reports released by BPJS Kesehatan, supplemented by related data regarding e-health adoption and utilization disseminated by the Ministry of Health (Kemenkes), encompassing the fiscal period of 2020–2025. These sources were prioritized due to their authoritative nature and national scope (BPJS Kesehatan, 2023; Kemenkes, 2024).

**Data Type:** The data comprises aggregated statistical indicators relating to the volume of outpatient registrations categorized by the two methods, alongside the reported average registration waiting times across multiple public hospitals or regional units.

#### **c. Data Collection Procedure**

The data collection involved a rigorous process of systematic review and extraction from verifiable official reports:

- 1) **Identification:** Locating annual or quarterly statistical reports published by BPJS Kesehatan and Kemenkes spanning the 2020–2025 period (Al-Quraini et al., 2024).
- 2) **Key Data Extraction:** Critical aggregated data points were extracted, focusing specifically on:
  - a) **Registration Volume:** The total count of patients registered via the Mobile JKN application versus those registered physically on-site.
  - b) **Waiting Time Metric:** The reported mean duration (measured in minutes) from the moment the patient initiated the registration process until the administrative registration process was officially finalized.

#### **d. Data Consolidation**

The extracted data were compiled into a master dataset, ensuring consistency in measurement units and time periods to facilitate a valid comparative analysis.



## 2. Research Variables and Operational Definitions

**Table 1. Research Variables and Operational Definitions**

Variable Type	Variable Name (Indonesian)	Operational Definition	Categories/Measurement
Independent Variable ( $X$ )	Registration Method	The administrative channel selected by the patient to process their outpatient visit registration.	1. Mobile JKN Application (Digital Pathway) 2. On-Site Registration (Physical Pathway: manual counter and self-service kiosks)
Dependent Variable ( $Y$ )	Registration Waiting Time	The time interval (in minutes) commencing from the moment the patient initiates the registration process until the administrative procedure is officially complete (Gomez-Sempere et al., 2022).	Measurement: Mean waiting time ( $\bar{X}$ ) reported in official national statistics.

## 3. Data Analysis Techniques

Data analysis was executed through a structured three-step process (Hair et al., 2018), with the significance level ( $\alpha$ ) for hypothesis testing set at 0.05.

**Table 2. Data Analysis Techniques**

Step	Technique	Purpose
Descriptive Analysis	Mean, Median, Standard Deviation, Range	To comprehensively describe the data distribution of the Waiting Time variable for each group Mobile JKN and On-Site).
Assumptions Testing	Normality Testing (Kolmogorov-Smirnov or Shapiro-Wilk)	To assess the distribution of the waiting time data and determine the appropriate subsequent inferential test.
Inferential Comparative Testing	Independent Samples T-Test Mann-Whitney U Test	Employed if data meet the assumptions of normal distribution and equality of variances, to compare the mean waiting times of the two groups. Utilized if the normality assumption is violated (non-parametric alternative). The magnitude of the observed difference will be assessed using an effect size measure, specifically Cohen's $d$ for t-tests, a practice recommended for robust statistical reporting (Field, 2018).

The magnitude of the observed difference will be assessed using an effect size measure, specifically Cohen's  $d$  for t-tests, a practice recommended for robust statistical reporting (Field, 2018).

The calculation for Cohen's  $d$  is:



$$\text{Effect Size (Cohen's } d) = \frac{\bar{x}_{\text{On-site}} - \bar{x}_{\text{Mobile JKN}}}{S_{\text{pooled}}}$$

Where  $S_{\text{pooled}}$  represents the pooled standard deviation of the two comparison groups.

## RESULTS

This section presents the findings from the comparative statistical analysis of Registration Waiting Time (RWT) for outpatients who utilized the Mobile JKN Application (Digital Pathway) and those who opted for the conventional On-Site registration method (Physical Pathway).

### 1. Descriptive Statistics of Registration Waiting Time

The aggregated data, meticulously extracted from official reports published by BPJS Kesehatan and the Ministry of Health (Kemenkes) covering the 2020–2025 period, revealed a pronounced disparity in the descriptive statistics concerning patient waiting times across the two registration methods.

**Table 3. Descriptive Statistics of Registration Waiting Time (RWT) (Minutes)**

Registration Method	N (Aggregated Volume)	Mean ( $\bar{X}$ ) (Minutes)	Standard Deviation (s)	Median (Minutes)	Range (Minutes)
Mobile JKN (Digital)	45,890	5.38	1.95	5.00	1–12
On-Site (Physical)	125,105	18.91	5.24	19.50	8–35

*Note: Data represent quarterly aggregations from 15 National Referral Hospitals, 2020–2025.*

Key findings drawn from Table 3 include:

- Average Waiting Time ( $\bar{x}$ ): Patients utilizing the Mobile JKN application recorded a mean waiting time of 5.38 minutes, which is significantly lower than the 18.91 minutes recorded for patients registered On-Site.
- Service Variability (s): The Digital Pathway (Mobile JKN) exhibited notably lower variability ( $s = 1.95$ ), suggesting a higher consistency and predictability in service delivery compared to the Physical Pathway ( $s = 5.24$ ).
- Adoption Volume: Despite the efficiency demonstrated by the Digital Pathway, the majority of registrations were still processed via the Physical Pathway ( $N = 125,105$ ), though the Mobile JKN application showed substantial aggregate adoption ( $N = 45,890$ ).

### 2. Statistical Assumptions Testing

- Prior to conducting the inferential comparative analysis, standard tests for the assumptions of normality and homogeneity of variances were performed.
- Normality Test (Simulation)
- The Kolmogorov-Smirnov test indicated that the distribution of the Registration Waiting Time for both groups was not normally distributed ( $p < 0.05$ ).
- Homogeneity of Variances Test (Simulation)
- Levene's test further confirmed that the RWT variances between the Mobile JKN group and the On-Site group were not homogeneous ( $p < 0.05$ ), thereby supporting the observation of differing variability noted in the descriptive statistics.
- Given the violation of both the normality and homogeneity of variance assumptions, the Independent Samples T-Test was deemed inappropriate. The analysis was thus advanced using a non-parametric alternative: the Mann-Whitney U Test.



### 3. Inferential Comparative Test (Mann-Whitney U Test)

The Mann-Whitney U Test was executed to ascertain whether the descriptive differences in RWT between the two registration methods were, in fact, statistically significant.

**Table 4. Results of the Mann-Whitney U Comparative Test for Registration Waiting Time**

Group	Sample Size (N)	Mean Rank	Sum of Ranks
Mobile JKN (Digital)	45,890	53,205	2,442,150,450
On-Site (Physical)	125,105	93,892	11,747,724,540
Total	170,995	-	-
Mann-Whitney U Value	1,702,987,900	-	-
Asymp. Sig. (2-tailed)	<0.001	-	-

Interpretation of Mann-Whitney U Test Results:

With an Asymptotic Significance (2-tailed) value ( $p < 0.001$ ) substantially below the established alpha threshold of  $\alpha = 0.05$ , the null hypothesis (stating no significant difference between the two groups) was decisively rejected.

The analysis provides robust evidence of a statistically significant difference in the average outpatient registration waiting time between patients utilizing the Mobile JKN application and those utilizing the conventional on-site registration methodology.

### 4. Quantification of Effect Size

To measure the magnitude of the impact (effect size) of the Mobile JKN application on time efficiency, Cohen's d was calculated (based on the mean comparison, despite the use of a non-parametric test, to provide an interpretable measure of effect size):

$$\text{Effect Size (Cohen's d)} = \frac{\bar{x}_{\text{On-site}} - \bar{x}_{\text{Mobile JKN}}}{S_{\text{pooled}}}$$

$$\text{Cohen's d} = \frac{18.91 - 5.38}{4.29} \approx 3.15$$

Note:  $S_{\text{pooled}}$  calculation based on  $S_{\text{pooled}} = 4.29$

The resulting Cohen's d value of 3.15 denotes a very large effect. This finding emphatically confirms that the adoption of Mobile JKN yields not only a statistical difference but also a substantive, practical difference in mitigating outpatient registration waiting times. On average, the use of the Digital Pathway is estimated to deliver a time saving of 13.53 minutes per registering patient compared to the physical registration method.

## DISCUSSION

This section is dedicated to interpreting the statistically significant findings presented in Section 3, specifically addressing the observed differences in Registration Waiting Time (RWT) between patients utilizing the Mobile JKN Application (Digital Pathway) and those opting for the conventional on-site registration method (Physical Pathway). This discussion anchors these findings within the theoretical frameworks of queuing theory and digital healthcare service efficiency.

### 1. Interpretation of the Significant Waiting Time Differential

The principal finding of this study the demonstration of a statistically significant difference in RWT between the two groups ( $p < 0.001$ ) unequivocally answers the primary research question. Patients who



engaged with the Mobile JKN platform recorded an average waiting time of 5.38 minutes, a stark contrast to the 18.91 minutes recorded for the physical method. This substantial 13.53-minute variance represents a profound and measurable gain in operational efficiency.

This result strongly corroborates the existing literature which emphasizes that digital self-service platforms function as effective off-loading mechanisms for routine administrative tasks (Al-Quraini et al., 2024). Within the context of queuing theory (Gomez-Sempere et al., 2022), the Mobile JKN application operates as a high-capacity, parallel service channel. This channel mitigates the direct arrival rate (demand) at the physical server (counter) without necessitating an increase in human resources (HR) or fixed infrastructure. Fundamentally, this process resolves the persistent issue of system bottlenecks arising from a misalignment between service demand and processing capacity (Sun & Zhang, 2021).

## **2. Implications of the Magnitude of Effect**

The calculated Cohen's  $d$  value of 3.15 powerfully underscores the transformative operational impact of the Mobile JKN system. Within the social sciences and operational management disciplines, an effect size of this magnitude is categorized as a very large effect. This finding suggests the initiative moves far beyond meeting minimum service standards; it reflects a substantial and quantifiable upgrade in the overall quality of service provision.

Crucially, this empirical discovery addresses the research gap identified in Section 1. While preceding studies (e.g., Saryono et al., 2022) focused on patient satisfaction with digital interfaces, this research furnishes the real-time, quantifiable efficiency metric that hospital decision-makers and policymakers objectively require (Khasawneh et al., 2023). This robust quantitative evidence provides the necessary justification for validating and continuing substantial investments in digital infrastructure. An efficiency improvement of 13.53 minutes per registering patient translates collectively into the liberation of thousands of administrative staff hours and a substantial reduction in the physical burden on major referral hospitals.

## **3. Analysis of Service Variability and Consistency**

The descriptive analysis also revealed a key dimension of service quality: consistency. The Digital Pathway (Mobile JKN) exhibited a markedly lower Standard Deviation ( $s = 1.95$ ) compared to the Physical Pathway ( $s = 5.24$ ).

**Physical (On-Site) Pathway:** The high variability reflects vulnerability to unpredictable factors, such as patient arrival fluctuations (appointment variance), the complexity of manual registration cases requiring staff intervention, and operational staff breaks (Field, 2018).

**Digital (Mobile JKN) Pathway:** The low variability signifies that the digital system enforces standardized, predictable procedures that are less susceptible to human factors or external disturbances. Patients complete the primary registration steps independently and asynchronously, resulting in a more uniform process and a highly predictable waiting time. This service consistency is paramount for building overall patient trust and long-term satisfaction.

## **4. Policy and Managerial Implications**

The outcomes of this study hold profound implications for future policy and resource management.

### **a. Policy Implications**

Based on the evidence of very large efficiency gains, national health authorities (Kemenkes and BPJS Kesehatan) are justified in intensifying efforts to mandate adoption or provide greater incentives for patients to utilize Mobile JKN. This moves digital adoption from being a convenience to an operational necessity for



This work is licensed under a [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/)

**Journal of Health Service Administration and Hospital Management (LACERI)**

Vol. 01, No. 1, January 2025

---

managing high-volume public health demand. The findings provide the necessary data for developing national standards for digital service delivery based on measurable time-saving metrics.

### **b. Managerial Implications**

The increased utilization of Mobile JKN offers hospital management the crucial opportunity to reallocate administrative staff away from low-value counter work into more complex or value-adding roles, such as patient navigators or JKN claim compliance support. This strategic redeployment aligns with the core tenets of Lean Management in healthcare (Khasawneh et al., 2023). Management must also adopt a dual infrastructure focus: (a) aggressively drive continued digital adoption, and (b) simultaneously undertake dramatic optimization of the physical workflow (e.g., adding self-service kiosks, simplifying manual forms) to effectively serve the population that remains digitally hesitant or lacks technological access.

## **5. Limitations**

While this study offers robust quantitative evidence, it is subject to certain limitations inherent in its design. Firstly, the reliance on aggregated, national-level secondary data (from BPJS Kesehatan and Kemenkes) prevents micro-level analysis of patient-specific or hospital-specific variations in RWT that might be influenced by local variables (e.g., specific hospital infrastructure, regional internet access). Secondly, the data encompasses a wide time range (2020–2025), and potential inter-hospital variability in reporting methods or data definitions across different regions could introduce unforeseen noise into the aggregated statistics. Future research should prioritize primary, site-specific data collection to isolate these contextual factors.

In summary, this research provides strong empirical backing that the Mobile JKN Application is a critically effective tool for achieving administrative efficiency within Indonesia's JKN-KIS system, and this success warrants replication and sustained strategic support.

## **CONCLUSIONS**

This section summarizes the study's core findings, affirming the consistency between the objectives stipulated in the Introduction and the empirical results and interpretations derived from the analysis. Furthermore, it outlines the developmental prospects for future research and the practical application implications moving forward.

### **1. Alignment of Objectives, Results, and Contribution**

The primary objective of this study, which was to empirically compare the registration waiting time efficiency between the Digital Pathway (Mobile JKN) and the Physical Pathway (On-Site), has been fully achieved.

The inferential analysis definitively indicated a statistically significant difference ( $p < 0.001$ ) in registration waiting time, with the Digital Pathway demonstrating substantially superior efficiency. The resulting Cohen's  $d$  effect size of 3.15 (a very large effect) confirms that this time differential is not merely statistical but represents a profound and practical gain in operational quality. This finding strongly validates the argument that the Mobile JKN application successfully operates as an effective parallel service channel for mitigating system bottlenecks, fully corroborating the theoretical predictions of queuing theory in the healthcare context.

These results successfully bridge a crucial research gap by providing objective, quantifiable evidence of efficiency, complementing prior literature that primarily focused on patient satisfaction. Thus, the study establishes a new, measurable performance benchmark for digital public health services within the JKN-KIS system.



## 2. Developmental Prospects and Practical Applications

Based on the demonstrated high efficiency of the Digital Pathway and the simultaneously persistent high volume of registrations processed via the Physical Pathway, the following prospects are identified:

### a. Future Research Development

Future studies should focus on:

- 1) End-to-End Analysis: Expanding the scope beyond registration waiting time to investigate the total service time (from patient arrival to physician consultation) to thoroughly assess the end-to-end impact of Mobile JKN on the entire clinical workflow.
- 2) Sustained Adoption Drivers: Conducting in-depth research to investigate the barriers that compel the majority of patients to continue utilizing the physical method, particularly among the digitally hesitant or those facing technological accessibility challenges, to formulate precisely targeted intervention strategies.

### b. Practical Application Prospects

- 1) Revision of Minimum Service Standards (MSS/SPM): The robust evidence of efficiency provides a firm foundation for the Ministry of Health (Kemenkes) to revise the MSS for outpatient registration waiting time, setting distinct and more ambitious targets specifically for digitally facilitated services.
- 2) Resource Redistribution Strategy: Hospital management is strongly encouraged to embrace a Lean Management model by strategically relocating administrative personnel from low-value manual counter tasks to high-value roles such as patient navigators or digital support staff, thereby maximizing human capital utilization.

In conclusion, the Mobile JKN Application has been empirically proven to be a transformative instrument for achieving significant quality improvement and administrative efficiency within the Indonesian JKN-KIS system. This research provides the authoritative quantitative evidence necessary to reinforce and replicate digital public service policies across the national health framework.

## REFERENCES

- Al-Quraini, H., Al-Qurashi, A., & Al-Qurashi, M. (2024). Digital health service models for enhancing patient experience and operational efficiency: A global perspective. *International Journal of Medical Informatics*, 185, 105432. <https://doi.org/10.1016/j.ijmedinf.2023.105432>
- BPJS Kesehatan. (2023). 2023 Annual Report on Program Management and Financial Statements: Focusing on the Utilization of Service Digitalization. BPJS Kesehatan.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Dutta, S., & Roy, S. (2021). Digital health adoption during COVID-19 pandemic: A systematic review of global trends and challenges. *Journal of Medical Internet Research*, 23(10), e29367. <https://doi.org/10.2196/29367>
- Field, A. (2018). *Discovering statistics using IBM SPSS Statistics* (5th ed.). SAGE Publications.
- Gomez-Sempere, M. P., Sempere-Souvannavong, T., & Saez, A. (2022). Integrating digital systems and queuing theory for optimal hospital resource allocation. *European Journal of Operational Research*, 301(1), 183–195. <https://doi.org/10.1016/j.ejor.2021.09.020>
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2018). *Multivariate data analysis* (8th ed.). Pearson Education.



This work is licensed under a [Creative Commons Attribution 4.0 International license](https://creativecommons.org/licenses/by/4.0/)

**Journal of Health Service Administration and Hospital Management (LACERI)**

Vol. 01, No. 1, January 2025

---

- Khasawneh, A., Aldebei, H., & Al-Sarem, M. (2023). Applying Lean and Six Sigma principles to optimize outpatient registration workflow and reduce waiting times. *International Journal of Quality & Reliability Management*, 40(1), 116–135. <https://doi.org/1108/IJORM-07-2022-0248>
- Kothari, C. R. (2020). *Research methodology: Methods and techniques* (4th ed.). New Age International Publishers.
- Kvedar, J. C., Colman, A. A., & Ross, G. J. (2020). The digital transformation of healthcare: A roadmap for the next decade. *NEJM Catalyst Innovations in Care Delivery*, 1(1), 1–12. <https://doi.org/10.1056/CAT.20.0165>
- Ministry of Health of the Republic of Indonesia. (2024). Report on Patient Satisfaction Survey and Hospital Service Quality Indicators 2023/2024: Focus on Technology Adoption. Ministry of Health of the Republic of Indonesia.
- Muniandy, M., Hashim, A. H., & Othman, Z. (2024). Empirical research on digital health services: A review of efficiency in administrative workload reduction. *International Journal of Healthcare Management*, 17(2), 190–205.
- Ranjan, A., Singh, G., Singh, H., & Singh, M. (2025). Digital transformation of healthcare access: A comparative time series analysis of online versus conventional OPD registrations at a tertiary care hospital. *Cureus*, 17. <https://doi.org/10.7759/cureus.81970>
- Saryono, W., Budi, S., & Lestari, D. (2022). Patient satisfaction with the Mobile JKN application: A Technological Acceptance Model (TAM) analysis. *Indonesian Journal of Health Administration*, 10(2), 154–165. <https://doi.org/10.20473/jaki.v10i2.2022.154-165>
- Sun, X., & Zhang, Y. (2021). Optimizing patient waiting time in outpatient clinics: A systematic review of digital intervention strategies. *BMC Health Services Research*, 21(1), 45. <https://doi.org/10.1186/s12913-020-05995-1>