

## The Influence of Online Queue Implementation, Service Quality, and Digital Literacy on Patient Satisfaction at Puskesmas M Surabaya

Ranti Ana Ningsih<sup>1</sup>, Kosasih<sup>2</sup>, Taufan Nugroho<sup>3</sup>, Vip Paramarta<sup>4</sup>, Farida Yuliaty<sup>5</sup>

<sup>1</sup> Master of Hospital Management, Universitas Sangga Buana YPKP, Bandung, Indonesia

<sup>2</sup> Master of Management, Universitas Sangga Buana YPKP, Bandung, Indonesia

<sup>3</sup> Master of Hospital Management, Universitas Sangga Buana YPKP, Bandung, Indonesia

<sup>4</sup> Master of Management, Universitas Sangga Buana YPKP, Bandung, Indonesia

<sup>5</sup> Master of Management, Universitas Sangga Buana YPKP, Bandung, Indonesia

Email: [rantianadr@gmail.com](mailto:rantianadr@gmail.com)<sup>1</sup>, [kosasih@usbypkp.ac.id](mailto:kosasih@usbypkp.ac.id)<sup>2</sup>, [ibr\\_nug@yahoo.co.id](mailto:ibr_nug@yahoo.co.id)<sup>3</sup>, [vip@usbypkp.ac.id](mailto:vip@usbypkp.ac.id)<sup>4</sup>, [farida.yuliaty@usbypkp.ac.id](mailto:farida.yuliaty@usbypkp.ac.id)<sup>5</sup>

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### **Abstract**

#### **Keywords:**

Online Queue, Service Quality, Digital Literacy, Patient Satisfaction, Puskesmas.

*This study aims to analyze the influence of online queue implementation, service quality, and digital literacy on patient satisfaction at Puskesmas M Surabaya. A quantitative approach with descriptive and verificative methods was employed. Data were collected via questionnaires distributed to 97 respondents, determined using the Slovin formula from a population of 3,059 outpatients. Multiple linear regression was conducted using SPSS. Results indicate that online queue implementation (X1) has a positive but non-significant effect on patient satisfaction ( $\beta = 0.148$ ; Sig. = 0.059), while service quality (X2) ( $\beta = 0.393$ ; Sig. = 0.000) and digital literacy (X3) ( $\beta = 0.345$ ; Sig. = 0.000) have a positive and significant effect, both partially and simultaneously ( $F = 11.918$ ; Sig. = 0.000). The coefficient of determination  $R^2 = 0.670$  indicates that 67% of patient satisfaction variance is explained by the three variables. These findings affirm that humanistic service interactions and patient digital literacy are critical complements to digital transformation in primary healthcare settings.*

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## INTRODUCTION

Primary Healthcare Centers (Puskesmas) serve as the frontline of Indonesia's national health system, acting as gatekeepers under the National Health Insurance (JKN) framework. They are mandated to deliver fast, quality, and efficient services. As public expectations grow and digital transformation accelerates, Puskesmas must adopt technology-based innovations to deliver responsive care.

One such innovation is the online queue system, designed to address the longstanding challenge of long waiting times and queue uncertainty. Puskesmas M Surabaya has implemented an online queue system since 2024. Data from April to June 2025 show that 3,059 out of 11,967 outpatient visits (approximately 25.5%) were registered through the online system. Ikhyana et al. (2023) found that institutions with digital queue systems reduced average patient waiting time by 30–50% compared to manual systems.

The success of digital health services, however, depends not only on technology but also on service quality and patient digital literacy. The SERVQUAL model developed by Parasuraman et al. (1988) highlights five quality dimensions: tangibles, reliability, responsiveness, assurance, and empathy. Applying technology without maintaining quality human interaction can actually reduce patient satisfaction (Kristianti & Sriwijaya, 2025). Moreover, digital literacy the ability to access, understand, and evaluate digital information determines whether patients can effectively use digital services (Norman & Skinner, 2006; Sahana & Surya, 2025).

Prior studies have examined these aspects in isolation. Ikhyana et al. (2023) assessed queue system effectiveness but did not measure patient satisfaction as a variable. Kristianti & Sriwijaya (2025) evaluated hospital service quality using SERVQUAL but excluded digital literacy and primary health settings. Prasastin et al. (2023) studied digital literacy and patient engagement but did not examine its simultaneous interaction with service quality and queue systems. This research gap motivates the present study.

This study aims to analyze the partial and simultaneous influence of online queue implementation, service quality, and digital literacy on patient satisfaction at Puskesmas M Surabaya. The novelty lies in the integration of all three variables within a single model in a primary healthcare context, which has not been comprehensively examined previously in Indonesia.

## METHODS

This study employed a quantitative approach using descriptive and verificative methods. The research was conducted at Puskesmas M Surabaya. The population consisted of 3,059 outpatients who used the online queue system during April–June 2025. Using the Slovin formula with a 10% margin of error, 97 respondents were selected through simple random sampling.

Primary data were collected using a structured questionnaire with a five-point Likert scale comprising 19 items. The instrument measured: (1) Online Queue Implementation (X1) through 5 indicators ease of access, information clarity, time efficiency, data security, and usage rate; (2) Service Quality (X2) using five SERVQUAL dimensions: tangibles, reliability, responsiveness, assurance, and empathy; (3) Digital Literacy (X3) based on the eHealth Literacy Scale (eHEALS); and (4) Patient Satisfaction (Y) through 5 items reflecting overall service experience.

Validity testing compared  $r$ -count against  $r$ -table (0.202 for  $N = 97$ ,  $\alpha = 5\%$ ). All 19 items were valid. Reliability testing using Cronbach's Alpha yielded a value of  $0.919 > 0.60$ , indicating very high reliability. Classical assumption tests normality (Kolmogorov-Smirnov), multicollinearity (Tolerance and VIF), autocorrelation (Durbin-Watson), and heteroscedasticity (Scatterplot and Glejser test) were conducted prior to hypothesis testing. Data were analyzed using multiple linear regression with SPSS.

## RESULTS AND DISCUSSION

### Respondens Characteristics

Of the 97 respondents, 68.0% were female and 32.0% male. By age group, 46.4% were aged 17–25 years, 25.8% aged 26–35, 15.5% aged 36–45, 8.2% aged 46–55, and 4.1% above 55, indicating that online queue users are predominantly younger, digitally-adaptive patients. By educational background, 61.7% completed senior high school, 27.7% held an undergraduate degree, 8.5% a diploma, and 2.1% a postgraduate degree.

### Descriptive Analysis

Online Queue Implementation (X1) item means ranged from 4.64 to 4.87, reflecting highly positive perceptions overall. The lowest-scoring item (item\_5, mean = 4.64; SD = 0.544) related to technical disruptions, indicating occasional system instability experienced by some patients. Service Quality (X2) item means ranged from 4.77 to 4.84, with the empathy dimension scoring highest (mean = 4.84), reflecting strong patient appreciation for staff attentiveness. Digital Literacy (X3) means ranged from 4.69 to 4.84, with the ability to evaluate digital information sources showing the highest variability (item\_13; SD = 0.507). Patient Satisfaction (Y) recorded the highest values among all variables (mean range: 4.79–4.91), with item\_17

(comfort during treatment using online queue) scoring highest at 4.91.

### Classical Assumption Tests

The Kolmogorov-Smirnov test yielded a significance value indicating normally distributed residuals. Multicollinearity assessment showed Tolerance values between 0.147 and 0.529 and VIF values between 1.892 and 6.807 all within acceptable thresholds (Tolerance > 0.10; VIF < 10). The Durbin-Watson value of 2.205 confirmed no autocorrelation. Scatterplot analysis and the Glejser test confirmed the absence of systematic heteroscedasticity. All classical assumptions were satisfied, confirming the validity of the regression model.

### Multiple Linear Regression Results

The regression equation derived from the analysis is:

$$Y = 2.316 + 0.148X_1 + 0.393X_2 + 0.345X_3 + e$$

Table 1 presents the hypothesis testing results

Variable	B	Beta	t / F	Sig.
Constant	2.316	—	5.175	0.000
Online Queue (X1)	0.148	0.167	1.918	0.059
Service Quality (X2)	0.393	0.406	3.757	0.000
Digital Literacy (X3)	0.345	0.355	3.756	0.000
F-test (Simultaneous)	—	—	11.918	0.000
R <sup>2</sup> / Adjusted R <sup>2</sup>	0.670 / 0.614			

The constant value of 2.316 (Sig. = 0.000) indicates that when all independent variables are held constant, the baseline patient satisfaction score is 2.316. Online queue implementation (X1) yielded a regression coefficient of 0.148 with Sig. = 0.059 > 0.05, meaning it did not significantly influence patient satisfaction at the 95% confidence level. Service quality (X2) produced the largest coefficient (B = 0.393; standardized Beta = 0.406; Sig. = 0.000), making it the most dominant variable. Digital literacy (X3) showed B = 0.345 (standardized Beta = 0.355; Sig. = 0.000), ranking second in influence. The F-test yielded F = 11.918 (Sig. = 0.000), confirming overall model significance. The coefficient of determination R<sup>2</sup> = 0.670 indicates that 67.0% of patient satisfaction variance is explained by the three independent variables, while the Adjusted R<sup>2</sup> = 0.614 provides a more conservative estimate accounting for sample size and variable count.

## DISCUSSION

### Online Queue Implementation and Patient Satisfaction

The finding that online queue implementation had a positive but non-significant effect on patient satisfaction ( $\beta = 0.148$ ; Sig. = 0.059) suggests that while patients generally view the system favorably, its direct statistical contribution to satisfaction remains insufficient at the 95% confidence level. This result is consistent with the Technology Acceptance Model (TAM) proposed by Davis (1989), which posits that perceived usefulness and perceived ease of use are the primary determinants of technology adoption. Even when a system is objectively useful, adoption barriers particularly among elderly patients and those with limited digital skills can diminish its perceived impact on overall satisfaction.

The relatively low adoption rate of 25.5% (only 3,059 out of 11,967 outpatient visits used the online queue during the study period) further explains the non-significant result: a large

proportion of patients still used the manual system and therefore could not directly experience the benefits of the digital queue. This is in line with Sugiman et al. (2025), who argued that the effectiveness of digital healthcare systems is contingent on adequate service quality and user readiness. Furthermore, the lowest-scoring descriptive item (item\_5; mean = 4.64) concerning technical disruptions indicates that residual system instability may undermine the positive impact that the queue system could otherwise have. These findings call for targeted system improvements and broader patient onboarding strategies to translate system availability into measurable satisfaction outcomes.

### **Service Quality and Patient Satisfaction**

Service quality emerged as the most dominant predictor of patient satisfaction ( $\beta = 0.393$ ; standardized Beta = 0.406; Sig. = 0.000), confirming that for every one-unit increase in perceived service quality, patient satisfaction increases by 0.393 units. This finding strongly supports the SERVQUAL framework (Parasuraman et al., 1988), which conceptualizes service quality as a multi-dimensional construct encompassing tangibles, reliability, responsiveness, assurance, and empathy. The primacy of this variable indicates that human-centered dimensions of care remain irreplaceable even as healthcare services become increasingly digitalized.

The descriptive results reinforce this interpretation: the empathy dimension (item\_10; mean = 4.84) received the highest patient rating, underscoring the central role of staff attentiveness and personalized communication in shaping satisfaction. This aligns with Niawati et al. (2020), who found that responsiveness and empathy exert the greatest influence on patient satisfaction in primary healthcare centers. Similarly, Kristianti & Sriwijaya (2025) demonstrated that service quality dimensions particularly those tied to human interaction remain decisive satisfaction determinants even when systems are digitalized. The practical implication is clear: digital transformation must be accompanied by sustained investment in staff competency and service culture, ensuring that technology enhancement and humanistic care reinforce rather than substitute each other.

### **Digital Literacy and Patient Satisfaction**

Digital literacy ranked as the second most influential variable ( $\beta = 0.345$ ; standardized Beta = 0.355; Sig. = 0.000), indicating that patients who are more capable of accessing, understanding, and evaluating digital health information tend to report higher satisfaction levels. This is theoretically grounded in the eHealth Literacy framework (Norman & Skinner, 2006), which emphasizes that functional engagement with digital health services requires competencies beyond mere device ownership including the ability to navigate platforms, interpret health information, and critically assess digital sources.

The descriptive analysis revealed that the evaluative dimension of digital literacy (item\_13; mean = 4.69; SD = 0.507) showed the greatest variability among patients, suggesting that while most respondents are comfortable accessing and using digital services, their capacity to critically evaluate online health information remains uneven. This finding corroborates Mulyanti et al. (2024), who documented that limited digital literacy especially among older and less-educated populations constitutes a primary barrier to digital service use in primary healthcare. Prasastin et al. (2023) similarly found a significant correlation between digital literacy levels and patient engagement in online queue services. Taken together, these results underscore the necessity of structured, inclusive digital literacy education programs at the point of care, targeting vulnerable patient groups who may otherwise be systematically excluded from the benefits of digital health innovation.

### Simultaneous Influence and Integrated Model

The simultaneous F-test confirmed that online queue implementation, service quality, and digital literacy collectively and significantly influence patient satisfaction ( $F = 11.918$ ;  $\text{Sig.} = 0.000$ ), with  $R^2 = 0.670$  indicating that the model explains 67.0% of the variance in patient satisfaction. This integrated result has important theoretical implications: it demonstrates that patient satisfaction in a digitalized primary healthcare setting cannot be attributed to any single factor but emerges from the dynamic interplay of technological infrastructure, human service quality, and patient competency.

This finding aligns with Al-hazmy & Subahtiyar (2025), who argued that sustainable healthcare quality requires the simultaneous development of systems, human resources, and patient capabilities. The remaining 33.0% unexplained variance points to other potential determinants not included in this model, such as physical facility conditions, actual waiting time, patient psychological states, and broader socioeconomic factors. These represent promising avenues for future research. The integrated model proposed in this study contributes a comprehensive framework for understanding patient satisfaction in digitally-transformed primary healthcare settings, extending beyond the single-variable analyses that have dominated prior literature on this topic.

### CONCLUSION

This study yielded four main conclusions. First, online queue implementation had a positive but non-significant effect on patient satisfaction ( $\text{Sig.} = 0.059$ ), reflecting ongoing adoption challenges. Second, service quality was the most dominant variable, with a positive and significant effect ( $\beta = 0.393$ ;  $\text{Sig.} = 0.000$ ), confirming that humanistic patient-staff interaction remains the primary satisfaction determinant. Third, digital literacy exerted a positive and significant influence as the second most important variable ( $\beta = 0.345$ ;  $\text{Sig.} = 0.000$ ). Fourth, the three variables simultaneously and significantly influenced patient satisfaction, explaining 67.0% of its variance ( $R^2 = 0.670$ ).

Practical implications include: (1) Puskesmas M management should optimize the queue application interface for user-friendliness, accompanied by visual guides and assistance staff for elderly patients; (2) regular service excellence training for healthcare staff is needed to sustain empathy and responsiveness dimensions; and (3) digital health literacy education programs should be conducted routinely, both in person and via social media platforms. This study was limited by its cross-sectional design within a single Puskesmas; caution is required when generalizing findings. Future research should incorporate additional variables such as physical facilities and actual waiting time, and expand to multiple Puskesmas for broader generalizability.

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