

The Effect of E-Patient and Green Hospital Integration on Patient Loyalty with Patient Satisfaction as a Mediating Variable

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ABSTRACT

This study aims to analyze the effect of integrating hospital digitalization and sustainability on patient satisfaction and loyalty at RSUD Dr. Moewardi, Surakarta. The study employs a quantitative approach using a survey method conducted among patients who have used the E-Patient application and received services at Dr. Moewardi Hospital, Surakarta. The results show that the implementation of the E-Patient system significantly increases patient satisfaction through ease of access and service efficiency, while the Green Hospital implementation positively affects patient comfort and trust. Furthermore, patient satisfaction is proven to be a mediating variable in building patient loyalty toward the hospital. This study provides an academic contribution by filling the literature gap concerning the relationship between digitalization, sustainability, and patient satisfaction. Practically, the findings can serve as recommendations for hospitals to optimize digital and sustainability strategies to enhance patient experience and strengthen long-term loyalty.

INTRODUCTION

Digitalization in the healthcare sector continues to grow rapidly. One of its forms is the E-Patient system, which enables online registration, access to medical records, and faster queuing processes. This has been proven to improve service quality and significantly reduce patient waiting times (Kim et al., 2022; Ghosh et al., 2023). Research indicates that the use of the E-Patient system can increase registration efficiency by up to 60% and reduce waiting times by 45% (Kim et al., 2022). Davis et al. (2021) also emphasized that ease of access, data security, and integration with other hospital services are key factors for the successful adoption of this application, which in turn contributes to patient satisfaction.

On the other hand, the Green Hospital concept has become an important strategy for providing healthcare services that are both efficient and environmentally friendly. The Sustainable Health Report (2023) recorded that around 45% of hospitals worldwide have implemented this concept, achieving up to a 30% reduction in carbon emissions over the past five years. Kumar et al. (2021) found that the implementation of environmentally friendly technologies increases patient satisfaction by up to 30%, particularly in aspects such as air quality, natural lighting, and safe medical waste management. The WHO (2022) also reported that hospitals adopting the Green Hospital concept have a 20% higher level of public trust compared to conventional hospitals.

However, most previous studies have discussed E-Patient systems and Green Hospitals separately, even though their integration has the potential to create a more holistic service experience (Kim et al., 2022; Almeida et al., 2022). RSUD Dr. Moewardi Surakarta has implemented the E-Patient system to improve administrative efficiency while also adopting Green Hospital principles to create an environmentally friendly setting. Unfortunately, there has been limited research examining how the combination of E-Patient systems and Green Hospital practices affects patient loyalty, with patient satisfaction serving as a mediating factor. Therefore, this study focuses on analyzing the impact of integrating healthcare digitalization and hospital sustainability on patient satisfaction and loyalty at RSUD Dr. Moewardi Surakarta.

THEORETICAL REVIEW

E-Patient Application

The E-Patient system is a digital platform developed by hospitals to manage administrative and medical data electronically. It allows online registration, access to medical records, and faster service delivery. According to Kim et al. (2022), such systems streamline hospital operations, reduce waiting time, and enhance service quality. Davis et al. (2021) emphasize that E-Patient platforms increase transparency and patient trust by providing real-time access to medical information.

Previous studies (Ghosh et al., 2023; Yulianto & Rahmawati, 2020) show that E-Patient systems improve efficiency, patient comfort, and satisfaction, which in turn strengthen loyalty. Thus, digital transformation plays a crucial role in enhancing hospital service performance and long-term patient engagement.

Green Hospital Concept

A Green Hospital adopts sustainable practices to reduce environmental impact and improve patient well-being. It includes efficient energy use, responsible waste management, and the creation of healthy green spaces (Kumar et al., 2021; WHO, 2022). Studies (Almeida et al., 2022; Nurhayati, 2021) reveal that Green Hospitals enhance patient comfort and satisfaction, while also improving public trust and hospital image. Environmentally friendly facilities foster positive emotional experiences, helping patients feel safer and more connected to the hospital, which contributes to loyalty (Sari & Yuliana, 2019; Pramudyo & Amalia, 2020).

Patient Satisfaction

Patient satisfaction reflects how well healthcare services meet or exceed patient expectations (Kotler & Keller, 2021). It depends on factors such as service quality, staff interaction, and facility comfort. Studies (Han et al., 2022; Davis et al., 2021) indicate that digital services like E-Patient improve satisfaction by increasing accessibility and transparency. Satisfaction also mediates the relationship between hospital service quality and patient loyalty, influencing patients' willingness to return or recommend the hospital.

Patient Loyalty

Patient loyalty refers to a patient's intention to reuse and recommend the hospital's services (Oliver, 2020). It is shaped by satisfaction, trust, and emotional connection (Zeithaml et al., 2022). Research (Han et al., 2022; Yusof et al., 2023) confirms that both digital innovations and sustainable environments strengthen loyalty by improving satisfaction and overall patient experience.

METHODOLOGY

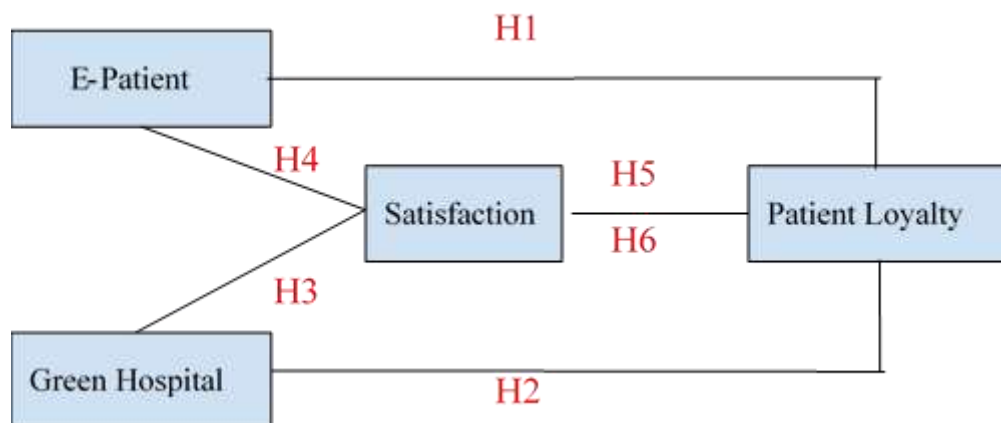


Figure. 1 Theoretical Framework

Hypothesis Description

- 1) There is a positive influence between the implementation of the E-Patient system and patient loyalty.

- 2) There is a positive influence between the implementation of the Green Hospital concept and patient loyalty.
- 3) There is an influence of the Green Hospital concept implementation on patient satisfaction.
- 4) There is an influence of the E-Patient system on patient satisfaction at RSUD Dr. Moewardi Surakarta.
- 5) The use of the E-Patient application positively affects patient loyalty through patient satisfaction.
- 6) The Green Hospital concept influences patient loyalty, mediated by patient satisfaction.

This study employs a quantitative approach with a structured questionnaire as the main instrument for collecting primary data from patients at RSUD Dr. Moewardi, Surakarta. The questionnaire was designed using Google Forms, and the collected data were processed using Smart PLS 4.0.

Population and Sample

The population in this study consists of patients who have used services at RSUD Dr. Moewardi Surakarta, particularly those who have utilized the E-Patient application and received services from the hospital implementing Green Hospital principles. The sample was selected using the purposive sampling technique based on specific criteria. The number of respondents was determined using the Slovin formula with a 5% margin of error, resulting in a minimum of 250 respondents.

Data Analysis

Validity Test

Table. 1 Validity test result

	<i>Average Variance Extracted (AVE)</i>	Keterangan
<i>E-Patient</i>	0.777	Valid
<i>Green Hospital</i>	0.774	Valid
Patient Satisfaction	0.660	Valid
Patient Loyalty	0.775	Valid

Source: Processed Primary Data, 2025

All instruments in this study have AVE values above 0.50, indicating that each indicator meets the criteria for convergent validity.

Reliability Test

Table. 2 reliability test result

	<i>Composite Reliability (CR)</i>	Keterangan
E-Patient	0.875	<i>Reliable</i>
<i>Green Hospital</i>	0.911	<i>Reliable</i>

Patient Satisfaction	0.853	<i>Reliable</i>
Patient Loyalty	0.912	<i>Reliable</i>

Source: Processed Primary Data, 2025

The results show that all Composite Reliability values exceed 0.70, indicating that the instruments used in this study are highly reliable and suitable for further analysis.

Structural Model Test (Inner Model)

1) Coefficient of Determination (R^2)

Table. 3 Coefficient of Determination (R^2)

	R Square	Adjusted R Square
Satisfaction	0.241	0.234
Loyalty	0.333	0.325

Source: Processed Primary Data, 2025

The data analysis results show that the R-Square value for Satisfaction is 0.241, with an Adjusted R-Square of 0.234, indicating a weak influence of independent variables on satisfaction. Meanwhile, the R-Square value for Loyalty is 0.333, with an Adjusted R-Square of 0.325, suggesting a moderate influence of independent variables on loyalty.

2) Predictive Relevance (Q^2)

$$Q^2 = 1 - [(1 - R^2_1) \times (1 - R^2_2)]$$

$$Q^2 = 1 - [(1 - 0.234) \times (1 - 0.325)]$$

$$Q^2 = 1 - 0.51705$$

$$Q^2 = 0.48295$$

The calculation result of Q-Square (0.48295) indicates that the model can explain approximately 48.3% of the data variance, showing that the model's predictive relevance is at a moderate level, as $Q^2 > 0.35$ is generally considered acceptable.

3) Path Coefficient Analysis

Table. 4 Path Coefficient Analysis

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T statistik (O/STDEV)	P Values	Description
E-Patient → Loyalty	0.240	0.239	0.061	3.921	0.000	Positive & Significant
Green Hospital ->	0.237	0.240	0.058	4.111	0.000	Positive & Significant

Loyalty						
Green Hospital -> Satisfaction	0.336	0.340	0.057	5.921	0.000	Positive & Significant
E Patient-> Satisfaction	0.365	0.369	0.054	6.815	0.000	Positive & Significant
E Patient -> Satisfaction -> Loyalty	0.122	0.125	0.027	4.512	0.000	Positive & Significant
Green Hospital -> Satisfaction -> Loyalty	0.113	0.116	0.027	4.123	0.000	Positive & Significant

Source: Processed Primary Data, 2025

Based on the path coefficient test results, all relationships between variables in the model are found to have positive and significant effects, confirming the hypothesized relationships in this study.

RESULT

The Effect of E-Patient on Patient Loyalty

Based on the results of the conducted analysis, this study concludes that the E-Patient system has a significant effect on patient loyalty at Dr. Moewardi General Hospital. This is evidenced by a significance value of 0.000, which is smaller than the 5% error threshold (0.05), and a t-statistic value of 3.921, which is greater than the t-table value of 1.970. These findings indicate that E-Patient plays an important role in influencing patient loyalty. This can be understood as the E-Patient system facilitates service access, accelerates processes, and enhances patient comfort. Efficient and transparent services make patients feel valued, thereby encouraging them to remain loyal to the hospital's services.

The Effect of Green Hospital on Patient Loyalty

This study concludes that the Green Hospital concept has a significant effect on patient loyalty at Dr. Moewardi General Hospital. This is evidenced by a significance value of 0.000, which is smaller than the 5% error threshold (0.05), and a t-statistic value of 4.111, which is greater than the t-table value of 1.970. These findings indicate that Green Hospital plays an important role in influencing patient loyalty because a clean, comfortable, and environmentally friendly hospital environment enhances patient trust and satisfaction, ultimately encouraging them to remain loyal to the hospital's services.

The Effect of Green Hospital on Patient Satisfaction

This study concludes that the Green Hospital concept has a significant effect on patient satisfaction at Dr. Moewardi General Hospital. This is evidenced by a significance value of 0.000, which is smaller than the 5% error threshold (0.05), and a t-statistic value of 5.921, which is greater than the t-table value of 1.970. These results show that Green Hospital plays an important role in influencing patient satisfaction by creating a comfortable, clean, and healthy environment. Environmentally friendly facilities provide a more pleasant treatment experience and improve patients' positive perceptions of hospital service quality.

The Effect of E-Patient on Patient Satisfaction

This study concludes that the E-Patient system has a significant effect on patient satisfaction at Dr. Moewardi General Hospital. This is evidenced by a significance value of 0.000, which is smaller than the 5% error threshold (0.05), and a t-statistic value of 6.815, which is greater than the t-table value of 1.970. These findings indicate that E-Patient plays an important role in influencing patient satisfaction because it simplifies service access, accelerates administrative processes, and provides more transparent information. This makes patients feel more comfortable and well-served efficiently.

The Effect of E-Patient on Patient Loyalty through Patient Satisfaction

This study concludes that the E-Patient system has a significant effect on patient loyalty through satisfaction at Dr. Moewardi General Hospital. This is evidenced by a significance value of 0.000, which is smaller than the 5% error threshold (0.05), and a t-statistic value of 4.512, which is greater than the t-table value of 1.970. The results of this study indicate that patient satisfaction acts as a mediator in the relationship between E-Patient and patient loyalty. In other words, the higher the satisfaction derived from using E-Patient, the greater the likelihood that patients will remain loyal to Dr. Moewardi General Hospital's services.

The Effect of Green Hospital on Patient Loyalty through Patient Satisfaction

This study concludes that the Green Hospital concept has a significant effect on patient loyalty through satisfaction at Dr. Moewardi General Hospital. This is evidenced by a significance value of 0.000, which is smaller than the 5% error threshold (0.05), and a t-statistic value of 4.123, which is greater than the t-table value of 1.970. The results of this study indicate that patient satisfaction acts as a mediator in the relationship between Green Hospital and patient loyalty. In other words, proper implementation of the Green Hospital concept can increase patient satisfaction, and this satisfaction subsequently fosters patient loyalty toward Dr. Moewardi General Hospital.

DISCUSSION

This study investigates the effects of E-Patient and Green Hospital implementation on patient satisfaction and loyalty at Dr. Moewardi General Hospital. The findings reveal that both E-Patient and Green Hospital have significant and positive influences on patient satisfaction and loyalty, either directly or through mediating effects. The use of the E-Patient system demonstrates strong effectiveness in enhancing service efficiency, transparency, and accessibility. This aligns with previous studies by Kim et al. (2022) and Davis et al. (2021), which emphasized that digital health applications improve patient experiences and foster long-term trust. The E-Patient system allows patients to register online, access medical records easily, and reduce waiting times, all of which contribute to greater satisfaction. Consequently, the convenience and reliability provided by E-Patient play a vital role in increasing patient loyalty.

Similarly, the Green Hospital concept shows a significant positive effect on both satisfaction and loyalty. The results are consistent with Kumar et al. (2021) and WHO (2022), who found that environmentally friendly hospital environments improve patients' perceptions of service quality and safety. A clean, comfortable, and sustainable hospital environment fosters emotional well-being and builds patient trust. These findings indicate that adopting sustainable practices not only benefits the environment but also strengthens patient relationships with healthcare institutions. The mediating role of patient satisfaction further supports the theoretical model proposed in this study. Both E-Patient and Green Hospital indirectly enhance patient loyalty by first improving satisfaction. This finding suggests that satisfaction serves as a crucial psychological bridge linking service quality and patient retention. In other words, digitalization and environmental sustainability efforts in healthcare must prioritize patient-centered outcomes to sustain long-term loyalty.

Overall, the results of this study emphasize the importance of integrating digital innovation and sustainability principles in hospital management. Such integration not only increases operational efficiency but also enhances patient experiences, satisfaction, and loyalty. Future research could explore these relationships in different hospital contexts or include additional moderating variables such as trust or perceived value to strengthen the model's explanatory power.

CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that both E-Patient and Green Hospital significantly influence patient satisfaction and loyalty at Dr. Moewardi General Hospital. E-Patient enhances satisfaction and loyalty through easier access, faster services, and greater transparency, while Green Hospital fosters trust and comfort through a clean, safe, and eco-friendly environment. Furthermore, patient satisfaction acts as a mediating factor – meaning higher satisfaction leads to stronger patient loyalty toward the hospital.

Recommendations

1. For Future Research

This study can serve as a reference for future research exploring the relationship between Green Hospital and E-Patient on patient satisfaction and loyalty. Future studies are encouraged to examine additional mediating or moderating variables, such as perceived service quality or patient trust, and to include multiple hospitals to obtain broader insights into digital and sustainable healthcare systems in Indonesia.

2. For Dr. Moewardi General Hospital

To further improve patient satisfaction and loyalty, the hospital should:

1. Enhance Patient Education and Assistance : Provide simple guides or direct support to help patients use the E-Patient app effectively.
2. Optimize Digital and Administrative Systems : Improve real-time information on doctor schedules and queues while streamlining digital registration and service flow.

3. Improve Service Quality and Staff Responsiveness : Offer regular staff training to maintain friendly, responsive, and informative interactions with patients.

These improvements can strengthen patient trust, satisfaction, and long-term loyalty to the hospital.

FURTHER STUDY

This study has several limitations that should be acknowledged. First, the research was conducted only at RSUD Dr. Moewardi Surakarta, which may limit the generalizability of the findings to other hospitals with different characteristics, management systems, or patient demographics. Second, the data collection relied solely on a structured questionnaire, which may not fully capture deeper insights or subjective experiences of patients regarding the implementation of E-Patient and Green Hospital systems. Third, the study used a cross-sectional approach, meaning the data were collected at a single point in time, so changes in patient satisfaction and loyalty over time could not be observed. Fourth, the study focused only on four main variables E-Patient, Green Hospital, patient satisfaction, and patient loyalty without including other potentially influential factors such as patient trust, service quality perception, or hospital reputation.

Despite these limitations, the findings still provide valuable insights and serve as a foundation for further studies to explore the integration of digitalization and sustainability in healthcare services more comprehensively.

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