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The Effect of Electronic Customer Relationship Management (E-CRM) on Patient Loyalty: The Mediating Role of Patient Satisfaction at Deli General Hospital, Medan

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ABSTRACT

This research examines the effect of Electronic Customer Relationship Management (E-CRM) on patient loyalty, with patient satisfaction as a mediating variable at Deli General Hospital, Medan. The study used a quantitative survey of 180 patients selected purposively. Partial Least Squares Structural Equation Modeling (PLS-SEM) was applied using SmartPLS. The estimates show a significant positive association between E-CRM and patient satisfaction (β = 0.600; t = 10.681; p = 0.001), as well as between E-CRM and patient loyalty (β = 0.246; t = 3.304; p = 0.001). Patient satisfaction is also significantly associated with loyalty (β = 0.221; t = 2.707; p = 0.007). The indirect coefficient from E-CRM to loyalty through satisfaction is significant (β = 0.132; t = 2.700; p = 0.007), indicating complementary partial mediation. The findings indicate that digital relationship activities are relevant to the patient experience, while satisfaction provides an additional pathway through which E-CRM is related to loyalty.

Keywords: E-CRM, Digital Transformation, Hospital, Patient Loyalty, Patient Satisfaction.

INTRODUCTION

Digitalization has reshaped the way hospitals communicate and deliver services to patients. Common examples include online registration, appointment scheduling, digital access to information, patient information systems, and electronic communication. These channels give hospitals additional means to manage patient relationships and may influence both satisfaction and loyalty through more convenient and responsive interactions.

Patient satisfaction is closely related to the development of lasting relationships between patients and hospitals (Hasjim et al., 2024). Patient loyalty reflects a patient's willingness to continue choosing a particular hospital (Maharani et al., 2023). In a healthcare market characterized by growing competition, hospitals must maintain service quality and positive patient experiences to retain existing patients and attract new ones. Effective relationship management can therefore support organizational continuity and long-term performance (Setiawati & Lailiyah, 2023).

Hospitals form an essential part of the healthcare system because they provide services that contribute to public health (Latuconsina et al., 2023). Their ability to operate efficiently while maintaining service standards is increasingly relevant as healthcare providers compete for patients. Statistics Indonesia (2025) reported that the number of hospitals in North Sumatra in 2025 was 22.85% higher than in 2016. The expansion of hospital capacity reflects a more competitive service environment and increases the need for effective patient relationship management.

Medan, one of Indonesia's major urban centers, has also experienced continued development of healthcare infrastructure. The expansion of hospital facilities has

contributed to a more diverse healthcare market and greater competition among providers.

One of the hospitals operating in this environment is Deli General Hospital (RSU Deli), located at Jl. Merbabu No. 18–20 A, Medan. RSU Deli was established in 1965 by the Deli Foundation and is one of the oldest hospitals in Medan. The hospital has experienced fluctuations in patient visits, as shown in Table 1.

Table 1.
Number of patient visits at RSU Deli, 2021–2025.

Year	Number of patients visit	Change (%)
2021	13,607	-
2022	16,114	+ 18.4%
2023	14,695	- 8.8%
2024	14,129	- 3.9%
2025	16,037	+ 13.5%

Source: Deli General Hospital, 2026

Table 1 summarizes inpatient and outpatient visits at RSU Deli between 2021 and 2025. The variation in annual visits indicates changes in the volume of services used by patients. For RSU Deli, this situation creates a practical need to strengthen patient relationships through service improvements and appropriate use of E-CRM. Digital relationship management can support this effort by facilitating communication and improving the continuity of interactions with patients (Ali & Alfayez, 2024).

A preliminary review of Google Reviews also identified comments concerning communication, the time required to obtain laboratory results, and the responsiveness of services. These observations were used only as contextual information for the research background. In addition, a preliminary survey involving 30 patients was conducted, with the results summarized in Table 2.

Table 2.
Preliminary Survey Results

Statement	n	Percentage
Very few communication access through digital platform	18	60.0%
Doctors' schedule information is difficult to obtain	23	76.7%
Information sources are limited	15	50.0%
No patient application is available for digital follow-up	13	43.3%

Source: observation results, 2026

The preliminary survey suggests that RSU Deli already uses several digital channels for communication and marketing, with WhatsApp emerging as the main channel reported by respondents. The responses also point to several service issues, particularly delayed responses, difficulty obtaining doctors' schedules, limited information channels, and the lack of a dedicated patient-facing digital platform.

Earlier research has linked E-CRM with customer or patient loyalty. Ali and Alfayez (2024) and Ismail et al. (2025) report positive relationships between E-CRM and loyalty, while Abdullah et al. (2024), Ismail et al. (2025) and Mokha and Kumar (2022) discuss satisfaction as part of the relationship between E-CRM and loyalty. In the hospital context, however, studies that specifically position patient satisfaction as a mediator between E-CRM and patient loyalty remain relatively limited.

Prior studies have examined E-CRM and customer outcomes in banking, e-commerce, education, and other service settings. Research has also addressed E-CRM in Indonesian healthcare services. However, relatively few studies have brought E-CRM, patient satisfaction, and patient loyalty into a single empirical model in which satisfaction

serves as the intervening variable at the hospital level. The present research examines that relationship at RSU Deli Medan and extends the discussion of digital relationship management to the Indonesian hospital context.

LITERATURE REVIEW

E-CRM

E-CRM supports the management of customer information and interactions through digital systems. Such systems can organize transaction records, customer information, and related reports that support functions such as marketing, sales, and accounting (Kakeesh et al., 2021; Sinaga et al., 2024). Kumar & Mokha (2022) view E-CRM as a means of developing ongoing reciprocal relationships with patients through internet-based communication channels, including email and websites. Solechan & Kusumo (2022) discuss E-CRM in relation to the application of CRM principles in electronic commerce. Rifa'i and Mulyana (2025) identify customer contact, ease of system use, pre- and post-purchase functions, complaint handling with prompt follow-up, and information personalization as relevant E-CRM indicators.

Based on these definitions, E-CRM in this research is defined as the use of digital communication and relationship-management mechanisms that enable hospitals to provide accessible, responsive, personalized, and continuous services to patients.

Digital interaction can also shape how patients perceive the quality of their relationship with a hospital. Personalized communication may strengthen patients' sense of being attended to and can contribute to satisfaction (Mahrinasari et al., 2023). Digital patient portals may extend this relationship by allowing patients to access medical records, communicate securely with healthcare professionals, obtain educational information, arrange appointments, manage prescription refills for chronic conditions, and complete payment-related activities (Carini et al., 2021).

Patient Loyalty

In general marketing research, loyalty describes a tendency to continue choosing or repurchasing a product or service as a result of favorable experiences and interactions (Vesuvius & Loo, 2025). Manurung and Sinaga (2025) associate loyalty with a sustained commitment to a product or service that is supported by satisfaction, trust, and positive perceptions of quality. Catherine & Rezeki (2025) similarly describe loyalty as an attachment to a brand or service provider that develops from positive experiences and perceived value. In healthcare, Eftitah et al. (2023) describe patient loyalty in terms of repeated visits and continued consideration of the same provider.

For this research, patient loyalty refers to the intention and commitment to continue choosing RSU Deli, supported by favorable service experiences, perceptions of quality, and relevant communication.

Aribowo et al. (2024) identify several behavioral indicators of patient loyalty, including the intention to return for treatment, continued use of the hospital's services, resistance to switching providers, and willingness to recommend the hospital to others.

Patient Satisfaction

Patient satisfaction represents patients' evaluations of the services they experience. Its assessment can provide information about how patients perceive routine hospital services and the quality of care (Ferreira et al., 2023). Gavurova et al. (2021) note that satisfaction is influenced by multiple aspects of healthcare delivery, including medical and nursing care and coordination among organizational units. Respect for patients' rights and appropriate service conditions are also relevant to the quality of healthcare. Salsa & Sinaga (2026) describe satisfaction as the positive or negative feeling that emerges when actual service performance is compared with prior expectations.

In this research, patient satisfaction refers to the overall evaluation formed when patients

compare what they expected from the hospital with the service experience they actually received.
According to Utomo et al. (2023), indicators of patient satisfaction are availability, responsiveness, comfort, and timeliness.

The Effect of E-CRM on Patient Satisfaction
Relationship marketing emphasizes the development of durable and mutually beneficial relationships rather than relying only on individual transactions (Morgan, 2024). Within this perspective, E-CRM gives hospitals digital tools for responding to individual patient needs, maintaining communication, and supporting continuing relationships. These functions can contribute to satisfaction when patients perceive the interaction as convenient and responsive.
Hospital E-CRM can take the form of online access to health information, digital registration, communication with hospital staff, service updates, and mechanisms for submitting complaints. When these functions reduce effort, improve access, and provide timely responses, patients may perceive the service experience more favorably. E-CRM is therefore expected to be positively associated with patient satisfaction.
This hypothesis is supported by empirical evidence from Abdullah et al. (2024), Perdana et al. (2024), and Solechan and Kusumo (2022).
H_1: E-CRM has an effect on Patient Satisfaction.

The Effect of E-CRM on Patient Loyalty
The Commitment-Trust Theory of relationship marketing developed by Morgan & Hunt (1994) emphasizes commitment and trust as central conditions for sustaining long-term relationships. Applied to healthcare, the framework provides a basis for understanding why consistent communication and dependable relationship management may encourage patients to remain connected with a hospital.

From this perspective, effective E-CRM may strengthen patient loyalty by making interactions more convenient, responsive, and relevant to individual needs. Timely replies, accessible information, appropriate follow-up, and continuity of communication can reinforce patients' willingness to continue using the hospital and to recommend it to others.
The finding is consistent with previous literature on the relationship between E-CRM and customer or patient loyalty, including Ali and Alfayez (2024), Axliano and Ikhram (2024), Ibrahim et al. (2021), Magatef et al. (2023), Putri et al. (2025), Rahma et al. (2023), Safira et al. (2021) and Stevannie et al. (2025).
H_2: E-CRM has an effect on Patient Loyalty

The Effect of Patient Satisfaction on Patient Loyalty
Expectation-Confirmation Theory explains satisfaction as an outcome of the comparison between prior expectations and the performance experienced after using a product or service (Vijay et al., 2025). When the actual experience meets or exceeds expectations, satisfaction is more likely to develop. This perspective is useful for explaining how patients' service experiences may translate into continued loyalty.
Patients who are satisfied with service quality, comfort, timeliness, and the extent to which care meets their expectations may be more willing to return to the same hospital. They may also be more inclined to recommend the hospital to relatives or other people. Higher satisfaction at RSU Deli Medan is therefore expected to correspond with stronger patient loyalty.
This hypothesis is supported by Al-Okaily (2023), Askari et al. (2024), Ghorbanzadeh (2021) and Prami et al. (2024).
H_3: Patient Satisfaction has an effect on Patient Loyalty

Patient Satisfaction as a Mediator of the Effect of E-CRM on Patient Loyalty

Digital E-CRM services may influence patient loyalty through satisfaction as well as through a direct relationship. Easier access to information, more responsive communication, personalized interaction, and convenient complaint handling can improve patients' evaluations of the service experience. When these experiences are satisfactory, they may reinforce the intention to continue using the hospital and to recommend it to others.

This hypothesis is supported by Hwang (2022), Mokha and Kumar (2022), Prami et al. (2024), Revda (2025) and Younis et al. (2024).

H_4: Patient Satisfaction mediates the effect of E-CRM on Patient Loyalty

The conceptual framework specifies the expected relationships among the three study variables. It was developed from the theoretical arguments and empirical literature reviewed in the preceding sections. Figure 1 therefore presents E-CRM as the explanatory variable, patient satisfaction as the mediating variable, and patient loyalty as the outcome variable, with the arrows representing the proposed hypotheses.

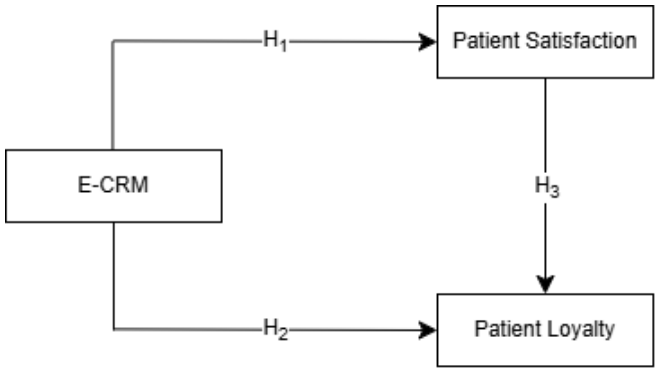


Figure 1. Conceptual Framework
Source: Developed by researchers based on literature review, 2026

RESEARCH METHOD

The research was carried out at RSU Deli, Jl. Merbabu No. 18–20 A, Medan, between June and August 2026. The study adopted a quantitative survey design. Data were collected through a structured questionnaire and analyzed with SmartPLS. The analysis covered the measurement model, including convergent and discriminant validity and construct reliability, as well as the structural model, including R-square, path coefficients, bootstrapping, and mediation analysis.

The target population comprised patients who had received inpatient or outpatient services at RSU Deli. A population refers to the set of subjects within a specified geographic and time boundary that is relevant to a research investigation (Syamsuddin et al., 2023). Because the number of accessible patients varied during the data-collection period, non-probability purposive sampling was applied. Following Hair et al. (2022), a sample size within the range of 100–200 respondents is considered appropriate for PLS-SEM applications. Accordingly, 180 respondents were included in this study, which falls within the recommended range and meets the predetermined respondent eligibility criteria.

1. Patients aged 18 years or older;
2. Patients who had received inpatient or outpatient services at RSU Deli; and
3. Patients who were willing to participate and complete the questionnaire

RESULTS AND DISCUSSION

Hidayat et al. (2025) describe validity as the extent to which a measurement instrument accurately captures the construct it is intended to measure. An instrument with adequate validity produces measurements that appropriately represent the construct, whereas inadequate validity can affect the quality of the resulting data. The convergent validity results are reported in Table 3.

Table 3.
Convergent Validity Test Results

Indicators		Loading	AVE
E-CRM	X1.S1	0.781	0.531
	X1.S2	0.824	
	X1.S3	0.748	
	X1.S4	0.816	
	X1.S5	0.661	
	X1.S6	0.741	
	X1.S7	0.640	
	X1.S9	0.579	
Patient satisfaction	Z.S2	0.586	0.511
	Z.S3	0.625	
	Z.S4	0.725	
	Z.S5	0.815	
	Z.S6	0.790	
	Z.S7	0.792	
	Z.S8	0.638	
Patient loyalty	Y.S2	0.765	0.530
	Y.S3	0.773	
	Y.S4	0.733	
	Y.S5	0.728	
	Y.S6	0.739	
	Y.S7	0.722	
	Y.S8	0.625	

Source: Research results, 2026

All retained indicators produced outer loadings above 0.50, supporting the convergent validity of the E-CRM, patient satisfaction, and patient loyalty constructs. Indicators X1.S8, X1.S10, Z.S1, and Y.S1 were removed during the initial assessment because they did not satisfy the measurement criteria applied in the model.

Table 4.
Heterotrait-Monotrait Ratio (HTMT)

	E-CRM	PS	PL
E-CRM			
PS	0.679		
PL	0.414	0.421	

Source: Research results, 2026

The AVE values for all three constructs were above the recommended 0.50 level, and the retained indicators also met the loading requirements. Together with the reliability results, these values support the adequacy of the retained measurement indicators.

Table 5.
Reliability Test

Construct	Cronbach's Alpha	Composite Reliability (rho_c)
E-CRM	0.871	0.881
Patient Loyalty	0.837	0.855
Patient Satisfaction	0.854	0.864

Source: Research results, 2026

In the reliability assessment, E-CRM obtained a Cronbach's Alpha of 0.871 and Composite Reliability (rho_c) of 0.881. Patient Loyalty recorded a Cronbach's Alpha of 0.837 and rho_c of 0.855, while Patient Satisfaction recorded a Cronbach's Alpha of 0.854 and rho_c of 0.864. Because all values exceeded the 0.70 threshold, each construct demonstrated good internal consistency, and the research instrument was considered reliable for measuring the three constructs.

Table 6.
R Square

Construct	R-Square	R Square Adjusted
Patient Satisfaction	0.359	0.356
Patient Loyalty	0.174	0.165

Source: Research results, 2026

For Patient Satisfaction, the R^2 value of 0.359 means that E-CRM accounts for 35.9% of the variance in satisfaction. The remaining 64.1% is associated with factors outside the model, potentially including staff service quality, facilities, waiting time, communication, costs, and environmental comfort.
For Patient Loyalty, the R^2 value is 0.174. Thus, E-CRM and Patient Satisfaction together account for 17.4% of the variance in loyalty, while 82.6% lies outside the explanatory scope of the model and may be related to factors such as trust, service quality, hospital image, perceived value, price, and patient commitment.

Table 7.
Path Coefficients Summary

Relationship	Path coefficient
E-CRM -> Patient Satisfaction	0.600
E-CRM -> Patient Loyalty	0.246
Patient Satisfaction -> Patient Loyalty	0.221

Source: Research results, 2026

The structural paths are positive for both E-CRM to Patient Satisfaction ($\beta = 0.600$) and E-CRM to Patient Loyalty ($\beta = 0.246$). The coefficients show that E-CRM is directly related to each endogenous construct in the proposed model.

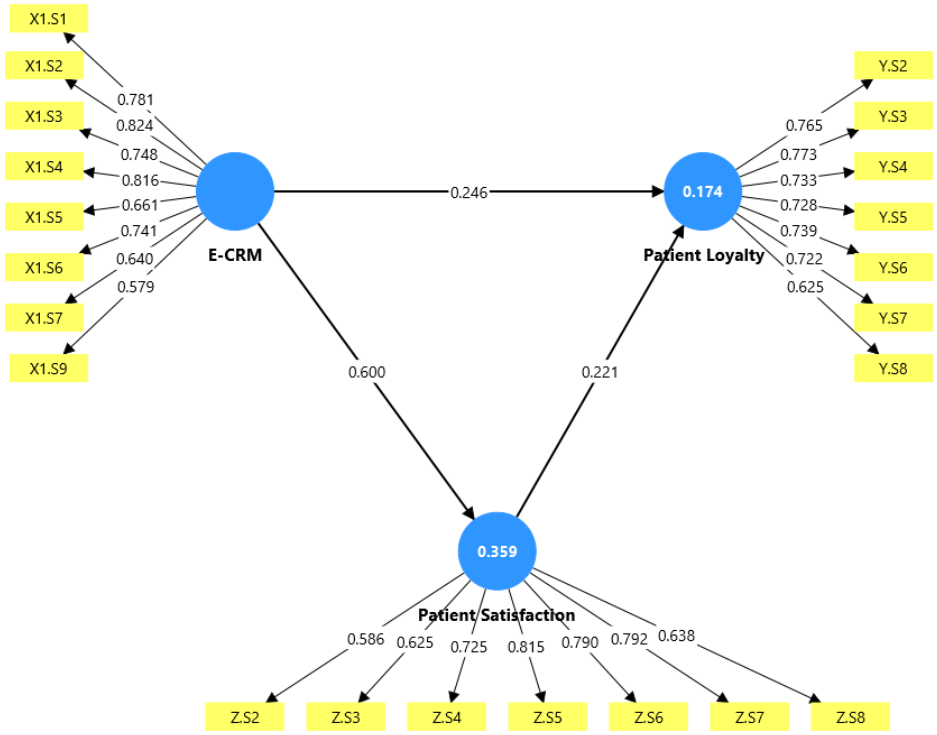


Figure 2. Inner Model (Source: processed data)

Table 8.
Hypothesis test

	Original Sample	Sample Mean	Standard Deviation	T statistics	P values
E-CRM -> PS	0.600	0.611	0.056	10.681	0.001
E-CRM -> PL	0.246	0.394	0.074	3.304	0.001
PS -> PL	0.221	0.228	0.082	2.707	0.007
E-CRM -> PS -> PL	0.132	0.138	0.049	2.700	0.007

Source: Research results, 2026

The bootstrapping results support all four hypotheses. E-CRM is positively and significantly associated with Patient Satisfaction (β = 0.600; t = 10.681; p = 0.001), supporting H_1. The direct path from E-CRM to Patient Loyalty is also positive and significant (β = 0.246; t = 3.304; p = 0.001), supporting H_2. Patient Satisfaction is positively associated with Patient Loyalty (β = 0.221; t = 2.707; p = 0.007), supporting H_3. The indirect path from E-CRM to Patient Loyalty through Patient Satisfaction is significant (β = 0.132; t = 2.700; p = 0.007), supporting H_4.

E-CRM has an Effect on Patient Satisfaction

At RSU Deli Medan, the E-CRM path to patient satisfaction is positive and statistically significant (β = 0.600; t = 10.681; p = 0.001). Digital registration, access to doctors' schedules, electronic communication, service information, and follow-up functions give the hospital additional ways to support patients throughout the service process. When these interactions reduce effort and improve responsiveness, patients may evaluate their service experience more positively.

The result is consistent with earlier work linking E-CRM with satisfaction (Abdullah et al., 2024; Perdana et al., 2024; Solechan & Kusumo, 2022) In healthcare, Mahrinasari et al. (2023) also report an association between E-CRM and patient satisfaction. The present result suggests that digital functions such as registration, scheduling information, communication, and follow-up can contribute to a more satisfactory patient experience.

E-CRM has an Effect on Patient Loyalty

The direct relationship between E-CRM and patient loyalty is positive and significant (β = 0.246; t = 3.304; p = 0.001). Digital relationship management can support continuity in the patient-hospital relationship by making communication easier, providing relevant information, and facilitating timely follow-up. These features may increase the likelihood that patients continue to use the hospital and recommend its services. The result is compatible with the commitment and trust perspective of relationship marketing (Morgan & Hunt, 1994)

Research in service and digital settings has also connected E-CRM with customer loyalty or e-loyalty (Ali & Alfayez, 2024; Axliano & Ikhram, 2024; Ibrahim et al., 2021; Magatef et al., 2023; Putri et al., 2025; Safira et al., 2021; Stevannie et al., 2025). Rahma et al. (2023) specifically discuss E-CRM and patient loyalty in hospitals, providing contextual support for examining this relationship in healthcare.

In practical terms, the result suggests that digital relationship management can contribute to loyalty when it enables more individualized communication, continued contact after treatment, appointment reminders, useful health information, and prompt responses to patient questions or complaints.

Patient Satisfaction has an Effect on Patient Loyalty

Patient satisfaction has a positive and significant relationship with patient loyalty (β = 0.221; t = 2.707; p = 0.007). Patients who perceive the hospital's services as meeting their expectations may be more inclined to return, continue using the services, and recommend the hospital. The result is also consistent with the logic of Expectation-Confirmation Theory, in which satisfaction develops from the comparison between expectations and actual experience (Vijay et al., 2025).

Previous studies have reported links between satisfaction and loyalty in digital and service contexts (Al-Okaily, 2023; Askari et al., 2024; Ghorbanzadeh, 2021; Prami et al., 2024). In healthcare, Aribowo et al. (2024) examine service quality in relation to patient satisfaction and loyalty, while Hasjim et al. (2024) report a relationship between patient satisfaction and loyalty. The present result indicates that satisfaction is one of the factors associated with continued patient loyalty at RSU Deli Medan.

Patient Satisfaction Mediates the Effect of E-CRM on Patient Loyalty.

The indirect effect of E-CRM on patient loyalty through satisfaction is positive and significant (β = 0.132; t = 2.700; p = 0.007). The total effect is 0.378, consisting of a direct effect of 0.246 and an indirect effect of 0.132. Because both paths are significant and operate in the same direction, the result indicates complementary partial mediation rather than full mediation.

Earlier studies have identified customer satisfaction as an intervening mechanism between E-CRM and loyalty in digital and service environments (Hwang, 2022; Mokha & Kumar, 2022; Prami et al., 2024; Revda, 2025; Younis et al., 2024). Rahma et al. (2023) provide healthcare-related evidence concerning E-CRM and patient loyalty. The present analysis extends this line of research by testing satisfaction as the mediating mechanism in a hospital setting in Indonesia.

RESEARCH IMPLICATIONS

Theoretical Implications

The research adds to the healthcare E-CRM literature by empirically examining patient satisfaction as a mediator linking digital relationship management with patient loyalty.

Managerial Implications

For hospital management, the results imply that E-CRM investment should be accompanied by improvements in the patient experience. Useful priorities include online

registration, responsive digital communication, appointment or examination reminders, reliable service information, and mechanisms for handling complaints promptly.

Policy Implications

The findings can support RSU Deli in developing more patient-oriented digital services. The hospital can improve digital communication, access to service information, appointment systems, and patient follow-up to provide a more responsive and convenient patient experience.

CONCLUSION

The analysis shows that E-CRM is positively and significantly related to patient satisfaction and patient loyalty, and that patient satisfaction is also positively related to patient loyalty. The significant indirect effect demonstrates complementary partial mediation, meaning that E-CRM is associated with loyalty both directly and through patient satisfaction.

From a theoretical perspective, the research extends discussion of E-CRM into the hospital setting by identifying patient satisfaction as an intervening variable between E-CRM and patient loyalty. The model adds healthcare evidence to a literature base that has more commonly examined digital relationship management in banking, e-commerce, and other service environments.

For practice, the results indicate that providing digital communication channels alone is not sufficient. Hospital E-CRM should make information accessible, responses timely, and interactions accurate and responsive to patients' needs.

RECOMMENDATION

RSU Deli Medan could strengthen its digital patient services through an integrated mobile platform covering online registration and queue management, secure access to laboratory results and medical records, appointment reminders via WhatsApp or SMS, patient-satisfaction monitoring, and two-way communication. Response-time standards for WhatsApp and other digital channels should be established, while information on doctors' schedules, service availability, costs, examination results, and health education should be updated consistently. Staff training in E-CRM would support implementation. Future studies may add variables such as trust, service quality, perceived value, and hospital image or examine multiple hospitals.

Several limitations should be considered. The research involved one hospital, which limits the extent to which the results can be generalized to other institutions. The use of purposive sampling and self-reported responses may also introduce perception bias. In addition, the model accounts for 17.4% of the variance in patient loyalty, leaving substantial variation unexplained. Subsequent research could incorporate factors such as service quality, trust, perceived value, hospital image, and patient commitment and could use data from multiple hospitals.

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