

Determination of Patient Loyalty Through Customer Relationship Management and Patient Satisfaction as Mediating Variables in Health Services (Case Study on Health Services of Indera Main Clinic)

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customer relationship management; patient satisfaction; patient loyalty; mediating variable; PLS-SEM; healthcare services

ABSTRACT

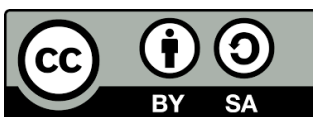
Background: Patient retention at Indera Main Clinic remains below its management target, motivating an examination of customer relationship management (CRM) and patient satisfaction.

Objective: This study examines the relationships of Operational CRM and Communication CRM with patient satisfaction and loyalty, including the mediating role of satisfaction.

Methods: A quantitative, cross-sectional survey involved 100 purposively selected outpatients aged at least 17 years who had visited the clinic twice or more. Sixteen five-point Likert items were analyzed using partial least squares structural equation modeling (PLS-SEM) in SmartPLS.

Results: Operational CRM and Communication CRM showed positive coefficients for satisfaction ($\beta = 0.167$ and 0.586) and loyalty ($\beta = 0.210$ and 0.271). Satisfaction was positively associated with loyalty ($\beta = 0.375$). The reported indirect coefficients were 0.063 and 0.220 , respectively. The models explained 33.9% of satisfaction variance and 36.5% of loyalty variance. Complete bootstrap significance statistics were not provided in the manuscript; consequently, inferential and mediation claims require confirmation.

Conclusion: Communication CRM exhibited the largest reported association with satisfaction, suggesting that interpersonal responsiveness warrants managerial attention alongside operational improvements. Findings are limited by the single-clinic, purposively sampled, cross-sectional design and should not be interpreted as definitive causal evidence for clinical policy decisions.



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INTRODUCTION

In the era of healthcare transformation 4.0, healthcare institutions face a major challenge in maintaining their business sustainability. The paradigm shift from provider-centered care to patient-centered care requires clinics to not only excel in clinical aspects, but also in patient experience management. The main problem often faced by healthcare services today is the high rate of patient churning or patient transfer to competitors. This phenomenon shows that medical quality alone is no longer enough to guarantee that patients will remain loyal to one healthcare facility. As emphasized by Meesala et al., (2018), the increasingly fierce competition in the

healthcare sector requires every healthcare facility to not only focus on clinical excellence, but also actively manage the experience and emotional connection with patients in order to create sustainable loyalty.

Patient loyalty is the main determinant for the long-term success of Indera Primary Clinic. According to Tjiptono, (2019), loyalty in healthcare services is a deep commitment to re-subscribe in the future, which is characterized by repeated visit behavior and willingness to recommend services to others (word of mouth). In the context of healthcare, loyalty is crucial because the cost of acquiring new patients is much higher than retaining existing patients. However, building loyalty in the healthcare sector requires a more personalized and sustainable approach. This is consistent with Nguyen & Nagase, (2021), who found in a Vietnamese tertiary hospital that patient satisfaction and patient complaints both influence patient loyalty, indicating that loyalty is shaped by how service experiences and grievances are managed.

The first determinant factor in building loyalty is the implementation of Customer Relationship Management (CRM). According to Buttle & Maklan, (2019), CRM is a business strategy that utilizes technology and data to manage interactions with customers to create long-term value. At Indera Utama Clinic, CRM is implemented to track medical history, manage control schedule reminders, and facilitate more effective two-way communication between patients and medical personnel. Through CRM, clinics can provide more personalized attention, so that patients feel valued not just as medical objects, but as partners in health. The urgency of implementing this strategy is supported by global market trends as listed in Figure 1.

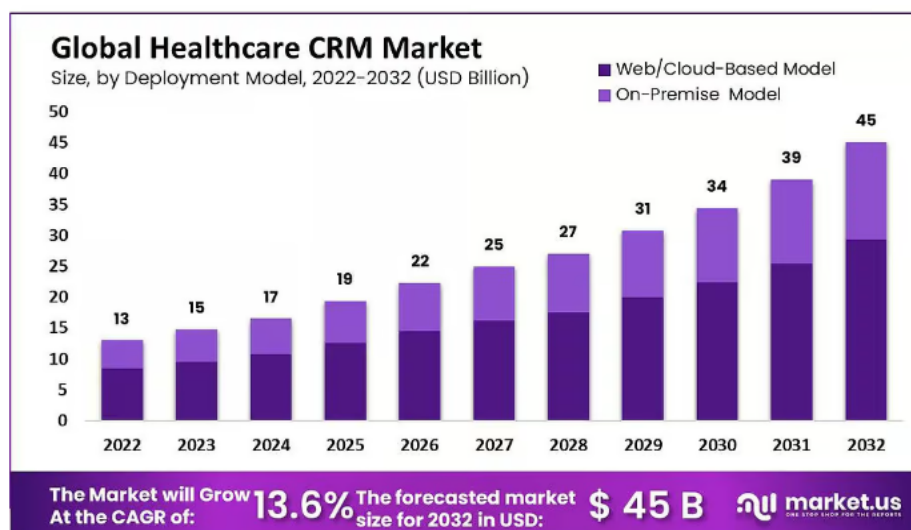


Figure 1. Global Healthcare CRM Market Size, by Deployment Model, 2022–2032 (USD Billion)

The data shows that the global healthcare CRM market is projected to grow rapidly to reach USD 45 Billion by 2032 with an annual growth rate (CAGR) of 13.6%. This confirms that customer relationship management has become a mandatory infrastructure standard for modern healthcare institutions. However, loyalty determination is not only influenced by how well the relationship is managed through CRM, but also relies heavily on Patient Satisfaction which serves as a mediating variable. Kotler & Keller, (2016) define satisfaction as a feeling of pleasure or disappointment resulting from a comparison between perceived service performance and patient expectations.

In the context of Indera's Main Clinic, satisfaction is a crucial bridge; the implementation of a sophisticated CRM will not be able to lock loyalty if the patient feels that the quality of physical service or medical interaction is unsatisfactory. Satisfaction is an absolute requirement before a patient decides to become loyal. This statement is in line with the findings of Bowden et al., (2017) who expressly stated that although loyal customers almost always feel satisfied, satisfaction does not automatically result in loyalty, consistent and intensive relationship management is required for satisfaction to transform into a long-term commitment. Empirical support for this bridging role is provided by Yıldırım et al., (2022), who reported that patient satisfaction mediates the effect of relationship marketing on hospital loyalty among inpatients of private hospitals in Turkey.

Furthermore, Liu et al., (2021) proved in the context of public hospitals in China that patient satisfaction can only significantly affect loyalty when mediated by patient trust, emphasizing that communicative and responsive interaction between staff and patients is an element that cannot be ignored. Similarly, Shie et al., (2022) showed that service encounters with doctors, nurses, and service staff positively affect patient trust and loyalty among elderly patients with chronic diseases, underscoring the relational nature of loyalty formation. Conditions in the field show that Indera Main Clinic still faces obstacles in converting visits into permanent loyalty. Based on initial and pre-research observations, it was found that there is a gap between the management target and the reality of the service as summarized in Table 1.

Table 1. Identification of Health Service Problems at Indera Main Clinics

No	Problem Indicators	Targets/Standards	Realization	Gap
1	Repeat Return Rate (Loyalty)	75%	48%	-27%
2	Effectiveness of CRM System (Reminder & Personal Response)	90%	62%	-28%
3	Patient Satisfaction Index (Scale 1-5)	4,50	3,85	-0,65
4	Service Complaints (Responsiveness & Empathy)	< 5%	15%	10%
5	Willingness to Recommend (Advocacy)	80%	52%	-28%

Source: Primary Data Processed (Initial Observation), 2026.

The data presented in Table 1 reveals significant problems in the patient loyalty indicator at Indera Main Clinic, where the revisit ratio only reaches 48%, leaving a deficit of 27% of the set target. This low loyalty rate is directly proportional to the effectiveness of the CRM system which is not optimal, with a gap of 28% in terms of personal response and patient interaction management. In addition, the failure to achieve the excellent satisfaction index which only touched 3.85 from the target of 4.50 indicates that patient satisfaction has not been able to play a maximum role as a mediator towards loyalty. This is exacerbated by the high percentage of complaints related to the responsiveness and empathy of officers at 15%, as well as the low level of patient advocacy or recommendations which is only at 52%. These findings confirm the urgency to re-examine the extent of CRM determination and patient satisfaction in forming loyalty to the health service.

The urgency of this research is also strengthened by previous studies, Based on this background, this study aims to analyze and prove the influence of these variables in a study

entitled: "Determination of Patient Loyalty Through Customer Relationship Management and Patient Satisfaction as a Mediating Variable in Health Services (Case Study on Indera's Main Clinical Health Services)". The specific contribution of this study is the simultaneous separation of Operational CRM and Communication CRM and the examination of satisfaction as a potential mediator within a single outpatient clinic. Unlike studies treating CRM as a single aggregate construct, this specification permits comparison of the reported operational and interpersonal pathways. This contribution is contextual and analytical rather than evidence of a new causal mechanism.

The preliminary clinic figures motivate the research, but their measurement procedures and source records should be documented before they are treated as independently verified baseline estimates. Based on the description of the background of the study, the formulation of the problem in this study is whether Operational CRM and Communication CRM have a positive and significant effect on Patient Satisfaction at Indera Clinic; whether Operational CRM and Communication CRM have a positive and significant effect on Patient Loyalty at Indera Clinic; whether Patient Satisfaction has a positive and significant effect on Patient Loyalty at Indera Clinic; and whether Operational CRM and Communication CRM have a significant effect on Patient Loyalty through Patient Satisfaction as a mediating variable at Indera Clinic.

In line with the formulation of the problem, this study aims to analyze and prove the influence of Operational CRM and Communication CRM on Patient Satisfaction, the influence of Operational CRM and Communication CRM on Patient Loyalty, the effect of Patient Satisfaction on Patient Loyalty, and the effect of Operational CRM and Communication CRM on Patient Loyalty through Patient Satisfaction as a mediating variable in Indera Clinic. Theoretically, this research is expected to contribute to the development of marketing management and operational management science, especially related to customer relationship management theory in the context of the healthcare industry, as well as provide empirical evidence on the role of patient satisfaction as a mediating variable in bridging the relationship between CRM strategy and long-term loyalty formation. Practically, this research is useful for Indera Utama Clinic as evaluation material and strategic input for management in optimizing CRM systems to improve patient retention and improve the quality of service interactions; for healthcare practitioners as a reference in designing patient-oriented service strategies to win competition in the private healthcare market; and for future researchers as a reference or database to explore similar topics with different variables or organizational contexts. To keep this research focused and in-depth, the scope of the research is limited to the Customer Relationship Management (CRM) strategy as an independent variable, Patient Satisfaction as a mediating variable, and Patient Loyalty as a dependent variable.

The research subjects are patients who use health services at Indera Main Clinic with the criteria of having visited at least twice in the past year, so that respondents have had sufficient interaction experience to provide an objective assessment. Data collection was carried out specifically for health services at Indera Main Clinic using a quantitative approach with a survey method, where the data analysis technique used is path analysis or Structural Equation Modeling (SEM) to test the relationship between variables. This research will be carried out for a certain period of time in 2026, which includes the primary data collection stage to the preparation of the final report.

METHOD

This study employed a quantitative approach with a causal (associative) design, which, according to Sugiyono, (2019), is used to test cause-and-effect relationships between independent and dependent variables. This design was applied to analyze the influence of Customer Relationship Management (CRM), which was deconstructed into Operational CRM and Communication CRM, on Patient Loyalty, with Patient Satisfaction serving as a mediating variable (J. F. Hair et al., 2019). The study population consisted of all outpatients who used health services at Indera Clinic during the data collection period.

This population was categorized as an unknown population because its size fluctuated (Sugiyono, 2019). The sample was determined using a Non-Probability Sampling technique through the Purposive Sampling method, with the criteria that respondents were Indera Clinic patients aged at least 17 years who had made at least two medical visits or examinations. Referring to (J. Hair, 2017), who stated that the minimum sample size for PLS-SEM should ideally be 50–100 respondents, this study set the sample size at 100 respondents, who were recruited over a one-month period (Saebah et al., 2022; Sekaran, 2016).

The survey captures associations at one point in time and cannot independently establish causality. Purposive inclusion of patients with at least two visits improves their ability to evaluate repeat encounters but excludes first-time patients and may overrepresent patients already inclined to return. The sample of 100 is reported as recruited; no *a priori* power analysis or model-specific sample-size assessment is available, so statistical power cannot be independently confirmed. Primary data were collected using questionnaires distributed either directly or through Google Forms (Sugiyono, 2019), while secondary data were obtained through literature reviews, previous studies, and journal articles.

The research instrument consisted of a closed-ended questionnaire using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), comprising 16 statements, with four items for each variable. Operational CRM was adapted from the dimensions of CRM technology and processes proposed by (Buttle & Maklan, 2019). Patient Satisfaction was developed based on the satisfaction theory of Kotler & Keller, (2016) and the SERVQUAL dimensions of Zeithaml et al., (2018). Patient Loyalty was adapted from the loyalty indicators proposed by (Tjiptono, 2019). The instrument was tested through an evaluation of the Outer Model (Measurement Model) using SmartPLS, which included a convergent validity test (outer loading > 0.70 and Average Variance Extracted [AVE] > 0.50), a discriminant validity test (Heterotrait-Monotrait Ratio [HTMT] < 0.90), and a construct reliability test (Cronbach's Alpha and Composite Reliability > 0.70) (J. Hair, 2017; J. F. Hair et al., 2019a; Henseler et al., 2016). Data were analyzed using Structural Equation Modeling (SEM) based on Partial Least Squares (PLS-SEM) through SmartPLS software. This method was selected because of its ability to predict complex structural models involving mediation pathways simultaneously without requiring strict assumptions of data normality (J. Hair, 2017; J. F. Hair et al., 2019).

The evaluation of the structural model (Inner Model) included the Coefficient of Determination (R^2/R -Square), with values of 0.75, 0.50, and 0.25 categorized as strong, moderate, and weak, respectively, and Effect Size (f^2/F -Square), with values of 0.02, 0.15, and 0.35 categorized as small, medium, and large, respectively (J. Hair, 2017). The significance of the paths for Hypotheses 1 to 5 was tested using a non-parametric bootstrapping procedure

with 5,000 subsamples. A hypothesis was accepted when the T-Statistic was > 1.96 and the P-Value was < 0.05 at a significance level of $\alpha = 5\%$. To address the sixth and seventh research questions concerning the role of Patient Satisfaction as a mediator, this study adopted the formal mediation procedure proposed by (J. Hair, 2017). Specifically, the Specific Indirect Effects were analyzed for the pathways Operational CRM $\rightarrow$ Patient Satisfaction $\rightarrow$ Patient Loyalty (H6) and Communication CRM $\rightarrow$ Patient Satisfaction $\rightarrow$ Patient Loyalty (H7). The mediation hypotheses were considered supported when the P-Value was < 0.05 and the T-Statistic was > 1.96 .

RESULTS AND DISCUSSION

Descriptive Statistical Analysis

Descriptive statistical analysis presents a concise picture of the concentration and spread of respondents' answers for each indicator. A high mean indicates the respondent's positive perception of the statement, while a small standard deviation value indicates the homogeneity of the answer. A summary of the results is presented in Table 2.

Table 2. Descriptive Statistics Research Indicators

Indicator	Mean	Std. Deviation	Min	Max
CO1	4,287	0,648	3	5
CO2	4,306	0,679	3	5
CO3	4,227	0,694	2	5
CO4	4,261	0,643	3	5
CK1	4,144	0,655	3	5
CK2	4,146	0,699	2	5
CK3	4,103	0,759	2	5
CK4	4,086	0,724	3	5
KP1	4,708	0,500	3	5
KP2	4,636	0,501	3	5
KP3	4,615	0,524	3	5
KP4	4,658	0,549	3	5
LP1	4,677	0,488	3	5
LP2	4,737	0,462	3	5
LP3	4,711	0,474	3	5
LP4	4,751	0,475	3	5

Source: Data Processed (SmartPLS), 2026

Based on Table 2, all indicators had an average score above 4.00 on a scale of 1–5, which means that respondents generally gave positive to very positive responses to the study variables. The indicators of Patient Satisfaction (KP) and Patient Loyalty (LP) obtained the highest average (in the range of 4.6–4.8) with the smallest standard deviation (below 0.55), indicating relatively uniform answers and very positive perceptions. Meanwhile, the Communication CRM (CK) and Operational CRM (CO) indicators were at an average of 4.0–4.3, which remained relatively high but with a slightly greater variation in answers.

Interpretive qualification: Table 1 summarizes preliminary clinic-level management indicators, whereas Table 2 describes perceptions from the selected survey respondents using

a five-point Likert instrument. These measures are not directly interchangeable. The original document does not specify the denominators, operational definitions, or exact collection dates of the preliminary indicators; those details require verification from clinic records before comparisons can be made.

Evaluation of Measurement Models (Outer Model)

The evaluation of the outer model aims to ensure that the measurement instrument meets the criteria of validity and reliability before being used to test the relationships between variables (J. Hair, 2017). This evaluation includes convergent validity tests through outer loading and Average Variance Extracted (AVE), discriminant validity tests through Heterotrait-Monotrait ratios (HTMT), and construct reliability tests through Cronbach's Alpha and Composite Reliability (CR).

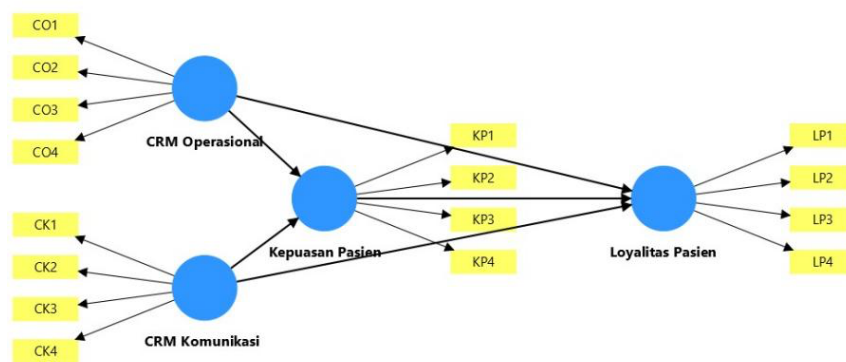


Figure 2. Latent Variable Model (Path Chart)

Source: SmartPLS Output, 2026

Figure 2 presents a research model path diagram that illustrates the relationship between two exogenous variables (Operational CRM and Communication CRM), the mediating variable (Patient Satisfaction), and the endogenous variable (Patient Loyalty), along with the reflective indicators of each construct. This model structure is the basis for the evaluation of the outer model and the inner model in the next discussion.

Convergent Validity Test

The outer loading value reflects the correlation between the indicator and its latent construct. An indicator is declared valid if it has a loading value > 0.70 , although a value between 0.40–0.70 can still be maintained as long as it does not lower the AVE below the threshold (J. F. Hair et al., 2019a). The test results are presented in Table 3.

Table 3. Outer Loading Results

Indicator	CRM Communication	Operational CRM	Patient Satisfaction	Patient Loyalty	Information
CK1	0,773	-	-	-	Valid
CK2	0,761	-	-	-	Valid
CK3	0,824	-	-	-	Valid
CK4	0,859	-	-	-	Valid
CO1	-	0,895	-	-	Valid

Indicator	CRM Communication	Operational CRM	Patient Satisfaction	Patient Loyalty	Information
CO2	-	0,816	-	-	Valid
CO3	-	0,749	-	-	Valid
CO4	-	0,777	-	-	Valid
KP1	-	-	0,724	-	Valid
KP2	-	-	0,694	-	Valid
KP3	-	-	0,766	-	Valid
KP4	-	-	0,754	-	Valid
LP1	-	-	-	0,770	Valid
LP2	-	-	-	0,834	Valid
LP3	-	-	-	0,821	Valid
LP4	-	-	-	0,816	Valid

Source: Data Processed (SmartPLS), 2026.

Based on Table 3, the majority of indicators have an outer loading value above 0.70. The Communication CRM variable has a loading between 0.761–0.859, with the highest contribution to CK4 (0.859) reflecting the staff's concern for patient needs. The Operational CRM variable has a loading between 0.749–0.895, with CO1 (0.895) being the strongest indicator representing the speed of registration and administration procedures. The Patient Loyalty variable has a loading between 0.770–0.834 with LP2 (0.834) being the most dominant indicator.

In the Patient Satisfaction variable, the KP2 indicator has a value of 0.694 which is marginally slightly below the strict threshold of 0.70. Referring to (J. F. Hair et al., 2019), indicators with a load of 0.60–0.70 do not need to be removed as long as they do not lower the AVE and CR values below the minimum limit. Because the AVE of Patient Satisfaction remains eligible (> 0.50), the KP2 indicator is maintained and all indicators are declared valid convergently.

Table 4. Nilai Average Variance Extracted (AVE)

Variable	AVE	Remarks
CRM Communication	0,648	Valid
Operational CRM	0,658	Valid
Patient Satisfaction	0,541	Valid
Patient Loyalty	0,657	Valid

Source: Data Processed (SmartPLS), 2026

Table 4 shows that all variables have AVE values above 0.50, namely Communication CRM (0.648), Operational CRM (0.658), Patient Satisfaction (0.541), and Patient Loyalty (0.657). Thus, all four variables meet the requirements of convergent validity, which means that the indicators are representative of being able to measure their latent constructs.

Discriminating Validity Test

Discriminant validity ensures that each construct is completely empirically different from other constructs. This study uses the Heterotrait-Monotrait Ratio (HTMT) criterion as a cutting-

edge standard, provided that the HTMT value between constructs < 0.90 (J. Hair, 2017; Henseler et al., 2016). The test results are presented in Table 5.

Table 5. Heterotrait-Monotrait Ratio (HTMT)

	CRM Communication	Operational CRM	Patient Satisfaction	Patient Loyalty
CRM Communication	-	-	-	-
Operational CRM	0,230	-	-	-
Patient Satisfaction	0,718	0,142	-	-
Patient Loyalty	0,541	0,211	0,690	-

Source: Data Processed (SmartPLS), 2026.

Based on Table 5, the entire inter-construct HTMT value was below the threshold of 0.90, with the highest value being 0.718 (between Communication CRM and Patient Satisfaction). These results prove that each latent construct has empirical uniqueness and does not overlap with each other, so that the discriminatory validity of the model is met.

Construct Reliability Test

Construct reliability was measured using Cronbach's Alpha and Composite Reliability (CR), with a threshold of > 0.70 each (J. Hair, 2017). The test results are presented in Table 10.

Table 6. Construct Reliability Test Results

Variable	Cronbach's Alpha	Composite Reliability (rho_c)	Remarks
CRM Communication	0,818	0,880	Reliable
Operational CRM	0,835	0,885	Reliable
Patient Satisfaction	0,718	0,825	Reliable
Patient Loyalty	0,826	0,884	Reliable

Source: Data Processed (SmartPLS), 2026

Table 6 shows that all variables have Cronbach's Alpha and Composite Reliability values above 0.70. Cronbach's Alpha values range from 0.718 (Patient Satisfaction) to 0.835 (Operational CRM), while Composite Reliability ranges from 0.825 to 0.885. Thus, all research instruments are proven to have good internal consistency and are reliable to measure each construct.

Multicollinearity Test (Collinearity Statistics)

The multicollinearity test is performed to ensure that there is no excessive correlation between indicators. A model is declared free of multicollinearity if the Variance Inflation Factor (VIF) value is < 5.00 (J. Hair, 2017). The test results are presented in Table 7.

Table 7. Multicollinearity Test (VIF) Results

Indicator	VIF	Indicator	VIF	Remarks
CK1	1,730	KP1	1,500	VIF < 5
CK2	1,522	KP2	1,222	VIF < 5
CK3	1,794	KP3	1,500	VIF < 5
CK4	2,128	KP4	1,428	VIF < 5
CO1	2,047	LP1	1,679	VIF < 5
CO2	1,644	LP2	1,951	VIF < 5
CO3	1,798	LP3	1,910	VIF < 5
CO4	1,790	LP4	1,726	VIF < 5

Source: Data Processed (SmartPLS), 2026

Based on Table 7, all indicators have a VIF value below 5.00, ranging from 1.222 (KP2) to 2.128 (CK4). These results confirm that there are no symptoms of multicollinearity in the model, so the estimated path coefficient is stable and unbiased.

Evaluation of Structural Models (Inner Model)

Once the measurement model meets the criteria of validity and reliability, the next stage is the evaluation of the structural model to assess the predictive strength of the model and test the research hypothesis (J. F. Hair et al., 2019). The evaluation includes the determination coefficient (R^2), the effect of the measure (f^2), the predictive relevance (Q^2), as well as the test of the significance of the path through the bootstrapping procedure.

Coefficient of Determination (R-Square)

The R^2 value measures the proportion of the variance of endogenous variables that are able to be explained by exogenous variables. Referring to J. Hair, (2017), the R^2 value is categorized as strong (0.75), moderate (0.50), and weak (0.25). The results are presented in Table 8.

Table 8. Value of Determination Coefficient (R-Square)

Variable endogenous	R-Square	R-Square Adjusted	Category
Patient Satisfaction	0,339	0,325	Moderate
Patient Loyalty	0,365	0,345	Moderate

Source: Data Processed (SmartPLS), 2026

The R^2 value of the Patient Satisfaction variable of 0.339 indicates that Communication CRM and Operational CRM are simultaneously able to explain 33.9% of the variation in Patient Satisfaction, while the remaining 66.1% is explained by factors other than the model. Meanwhile, the R^2 value of Patient Loyalty of 0.365 indicates that Communication CRM, Operational CRM, and Patient Satisfaction together explain 36.5% of the variation in Patient Loyalty, with the remaining 63.5% being influenced by other factors such as brand image, price perception, or patient trust. Both R^2 values fall into the moderate category, which means that the model has substantial predictive capacity.

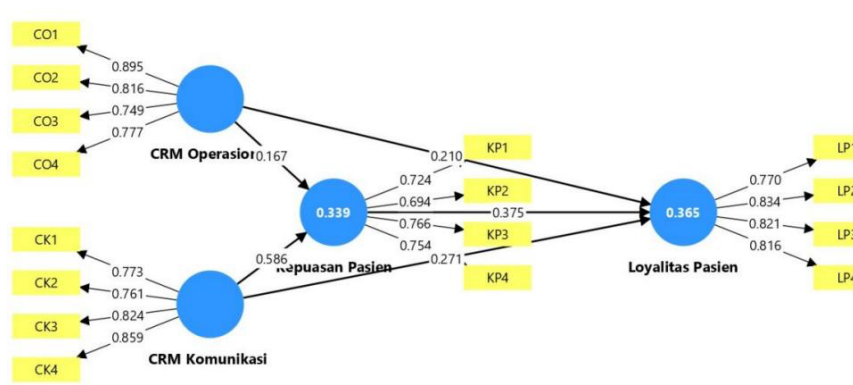


Figure 3. Output Model PLS-SEM Algorithm

Source: SmartPLS Output, 2026

Figure 3 shows the results of the PLS-SEM algorithm estimation which contains the outer loading value of each indicator, the interconstruct path coefficient, and the R^2 value in the endogenous variable circle (0.339 for Patient Satisfaction and 0.365 for Patient Loyalty). This visualization confirms the numerical values that have been presented in the previous tables.

Size Effect (*f*-Square)

The f^2 value measures the substantive impact of each exogenous variable on the endogenous variable, with classifications of 0.02 (small), 0.15 (medium), and 0.35 (large) (J. Hair, 2017) The results are presented in Table 9.

Table 9. Value of Size Effect (*f*-Square)

Influence Path	<i>f</i> -Square	Category: Effect
CRM Communication → Patient Satisfaction	0,505	Large
CRM Communication → Patient Loyalty	0,075	Small–Medium
Operational CRM → Patient Satisfaction	0,041	Small
Operational CRM → Patient Loyalty	0,065	Small
Patient Satisfaction → Patient Loyalty	0,146	Medium

Source: Data Processed (SmartPLS), 2026

Based on Table 9, the effect of CRM Communication on Patient Satisfaction has the largest size effect ($f^2 = 0.505$), classified as a large category, which confirms that communication quality is the strongest determinant of patient satisfaction. The effect of Patient Satisfaction on Patient Loyalty has a moderate effect ($f^2 = 0.146$), while the other pathways are classified as small to small–medium effects. This pattern indicates that the communication dimension makes a dominant substantive contribution in the model.

Predictive Relevance (*Q*-Square)

The Q^2 test assesses the predictive relevance of the model. The model is declared to have predictive relevance if $Q^2 > 0$ (J. F. Hair et al., 2019). The Q^2 value is calculated by the formula $Q^2 = 1 - (1 - R^2_1)(1 - R^2_2)$, so that $Q^2 = 1 - (1 - 0.339)(1 - 0.365) = 1 - (0.661 \times 0.635) = 1 - 0.4197 = 0.580$.

The Q^2 value of 0.580 (58.0%) is greater than zero, so the structural model has strong predictive relevance. This means that the combination of CRM Communication, Operational

CRM, and Patient Satisfaction constructs has a good capacity to predict the phenomenon of Patient Loyalty at Indera's Main Clinic.

Hypothesis Testing

Hypothesis testing was carried out through a bootstrapping procedure with 5,000 subsamples. The influence hypothesis was immediately accepted if the t-statistical value was > 1.96 and the p-value was < 0.05 at a significance level of 5% (J. Hair, 2017; Henseler et al., 2016). The direction and strength of the relationship were evaluated through the path coefficient.

Direct Effect Testing

Table 10. Results of Direct Influence Path Coefficient

Hypothesis	Structural Pathways	Coefficient (β)	Directions	Verdict
H1	Operational CRM → Patient Satisfaction	0,167	Positive	Accepted
H2	CRM Communication → Patient Satisfaction	0,586	Positive	Accepted
H3	Operational CRM → Patient Loyalty	0,210	Positive	Accepted
H4	CRM Communication → Patient Loyalty	0,271	Positive	Accepted
H5	Patient Satisfaction → Patient Loyalty	0,375	Positive	Accepted

Source: Data Processed (SmartPLS), 2026

Based on Table 10, all direct influence pathways showed positive and unidirectional coefficients. The effect of Operational CRM on Patient Satisfaction ($\beta = 0.167$) was positive; optimization of the operational function of the clinical service system contributed positively to the increase in patient satisfaction, although with a moderate-low magnitude. The effect of CRM Communication on Patient Satisfaction ($\beta = 0.586$) was the strongest coefficient in the model, proving that the interactive communication dimension is the most dominant determinant in shaping patient satisfaction at Indera Main Clinic. Table 10 provides path coefficients and acceptance labels but omits standard errors, t-statistics, p-values, and bootstrap confidence intervals. Positive coefficients alone do not establish statistical significance. The original SmartPLS bootstrapping output is needed before the five direct hypotheses can be reported as statistically supported. The effect of Operational CRM on Patient Loyalty ($\beta = 0.210$) was positive; the efficiency of medical and administrative operational procedures was directly correlated with the patient's decision to remain loyal. The effect of CRM Communication on Patient Loyalty ($\beta = 0.271$) was positive; strengthening the management of interactive communication directly was able to increase long-term patient loyalty. The Effect of Patient Satisfaction on Patient Loyalty ($\beta = 0.375$) was the strongest direct influence towards loyalty; Patient psychological satisfaction was proven to be a determinant stimulant in encouraging loyalty behavioral commitment.

Indirect Effect Testing

The mediation effect test answers the formulation of the sixth and seventh problems, namely the role of Patient Satisfaction in mediating the influence of Operational CRM and Communication CRM on Patient Loyalty. The results are presented in Table 11.

Table 11. Results of Indirect Influence Path Coefficient

Hypothesis	Mediation Pathway	Coefficient (β)	Verdict
H6	Operational CRM $\rightarrow$ Patient Satisfaction $\rightarrow$ Patient Loyalty	0,063	Accepted (Partial Mediation)
H7	CRM Communication $\rightarrow$ Patient Satisfaction $\rightarrow$ Patient Loyalty	0,220	Accepted (Partial Mediation)

Source: Data Processed (SmartPLS), 2026.

The results in Table 11 show that both mediation pathways have a positive coefficient. The H7 pathway (Communication CRM $\rightarrow$ Patient Satisfaction $\rightarrow$ Patient Loyalty) has an indirect coefficient of 0.220, greater than the H6 pathway (Operational CRM $\rightarrow$ Patient Satisfaction $\rightarrow$ Patient Loyalty) of 0.063. Because the direct influence of the two exogenous variables on loyalty remains significant, Patient Satisfaction plays the role of partial mediation. Thus, Patient Satisfaction has proven to be a bridge that strengthens the transformation of CRM strategies into patient loyalty, with a much stronger mediation role in the communication dimension than in the operational dimension. Mediation qualification: The positive products of the constituent path coefficients are consistent with the reported indirect coefficients, but the statistical significance of these indirect effects cannot be verified without bootstrap confidence intervals or corresponding t- and p-values. Therefore, partial mediation remains provisional rather than conclusively established. A summary of the decision on all research hypotheses is presented in Table 12.

Table 12. Summary of Hypothesis Testing Results

Hipotesis	Statement	b	Verdict
H1	Operational CRM has a positive effect on Patient Satisfaction	0,167	Accepted
H2	CRM Communication has a positive effect on Patient Satisfaction	0,586	Accepted
H3	Operational CRM has a positive effect on Patient Loyalty	0,210	Accepted
H4	CRM Communication has a positive effect on Patient Loyalty	0,271	Accepted
H5	Patient Satisfaction has a Positive Effect on Patient Loyalty	0,375	Accepted
H6	Patient Satisfaction mediates Operational CRM $\rightarrow$ Patient Loyalty	0,063	Accepted
H7	Patient Satisfaction mediates CRM Communication $\rightarrow$ Patient Loyalty	0,220	Accepted

Source: Data Processed, 2026.

DISCUSSION

The Influence of Operational CRM on Patient Satisfaction (H1)

The test results prove that Operational CRM has a positive effect on Patient Satisfaction ($\beta = 0.167$; $f^2 = 0.041$). These findings mean that increasing the effectiveness of the operational system including administrative speed, accuracy of patient data management, optimization of queue technology, and accessibility of information contribute positively to patient satisfaction. These findings reinforce the results of Yaghoubi et al., (2017) who through SEM in Iranian hospitals proved that the operational component of CRM has a positive effect on patient satisfaction.

Theoretically, these results support the argument of Buttle & Maklan, (2019) that CRM as a core business strategy should be supported by a solid process infrastructure and technology, so that administrative friction is reduced and the perception of service quality is increased (Saebah et al., 2023; Zeithaml et al., 2018). The relatively moderate-lower magnitude of influence indicates that the operational aspect, while important, is not the main determinant of satisfaction in the context of ophthalmological clinics. Across the reported paths, Communication CRM has a larger coefficient for satisfaction than Operational CRM. This difference may reflect the salience of staff responsiveness and clarity of explanations during clinical encounters; however, the cross-sectional design does not distinguish this interpretation from unmeasured differences in patient expectations or previous experiences. The results service-quality findings of Meesala et al., (2018), although differences in setting and operationalization limit direct numerical comparison.

The Effect of CRM Communication on Patient Satisfaction (H2)

CRM Communication had a positive effect on Patient Satisfaction with the strongest coefficient in the model ($\beta = 0.586$; $f^2 = 0.505$, large effect category). Dimensions that include staff friendliness, speed of complaint response, clarity of medical communication, and concern for patient needs proved to be much more dominant than Operational CRM. Meesala et al., (2018) who concluded that the dimensions of empathy and responsiveness have the strongest influence on patient satisfaction. This confirms Tjiptono, (2019) perspective that the emotional connection between patients and medical staff is a source of satisfaction that cannot be replaced by technology alone. This finding is also consistent with Jameel et al., (2025), who demonstrated that practitioner–patient communication has a significant positive effect on patient satisfaction among outpatients in public hospitals in Saudi Arabia.

The Influence of Operational CRM on Patient Loyalty (H3)

Operational CRM has a positive effect on Patient Loyalty ($\beta = 0.210$; $f^2 = 0.065$). The efficiency of the clinic's operational system, ease of access to doctor's schedules, queue speed, and accuracy of medical data directly contribute to the patient's decision to return., and Sari et al. (2020) who proved that the implementation of CRM in Indonesian hospitals has a real impact on loyalty through the reduction of administrative barriers. Although this direct influence is weaker than that of communication channels, its contribution is still practically meaningful as the foundation of a comfortable service experience. This result is further supported by Hussain et al., (2025), who found that administrative procedures were significantly related to patient satisfaction and loyalty in public hospitals in Pakistan, confirming the relevance of efficient operational processes for loyalty formation.

The Influence of CRM Communication on Patient Loyalty (H4)

Communication CRM has a positive effect on Patient Loyalty ($\beta = 0.271$; $f^2 = 0.075$), stronger than the direct influence of Operational CRM. In the context of ophthalmology healthcare, the interpersonal and communicative dimensions have a greater role in shaping patient long-term commitment. These findings Rahimi & Gunlu, (2016) who emphasized that the success of CRM in building loyalty is highly dependent on the alignment of human components (people). Patient trust in the doctor's competence and attitude is the main differentiating factor that encourages patients not to switch to competitors.

The Effect of Patient Satisfaction on Patient Loyalty (H5)

Patient Satisfaction has a positive effect on Patient Loyalty with the strongest direct coefficient towards loyalty ($\beta = 0.375$; $f^2 = 0.146$, moderate effect category). This confirms the position of satisfaction as a central determinant of loyalty in the healthcare marketing literature. These findings are in line with Liu et al., (2021) on Chinese public hospitals.

The Role of Patient Satisfaction Mediation (H6 and H7)

Mediation effect testing proved that Patient Satisfaction acted as a partial mediator on both pathways. The H6 pathway (Operational CRM $\rightarrow$ Satisfaction $\rightarrow$ Loyalty) had an indirect effect of $\beta = 0.063$, while the H7 pathway (Communication CRM $\rightarrow$ Satisfaction $\rightarrow$ Loyalty) had a much greater indirect effect of $\beta = 0.220$. In the communication path, the total effect reached 0.491 (direct 0.271 + indirect 0.220), which means that almost half of the influence of CRM Communication on loyalty was channeled through satisfaction.

This partial mediation pattern is in line with the argument of Bowden et al., (2017) that although satisfaction is a prerequisite for loyalty, loyalty does not solely come from satisfaction, but is also influenced by commitment, trust, and barriers to transfer. Based on all the findings, there are several strategic implications for the management of Indera Primary Clinic. Given that Communication CRM has the greatest influence on satisfaction ($\beta = 0.586$) and the second strongest direct influence on loyalty ($\beta = 0.271$), management needs to prioritize the development of Communication CRM through staff soft skills training, a responsive complaint management system, and empathetic medical communication standards. In addition, optimization of the Operational CRM system is also important, considering that the CO1 indicator (registration/administration speed) has the highest outer loading (0.895); investment in the update of electronic medical record systems and digital patient portals will have a direct impact on satisfaction and loyalty. In addition, because satisfaction has the strongest direct influence on loyalty ($\beta = 0.375$), management needs to strengthen satisfaction as a bridge to loyalty by regularly monitoring satisfaction through Net Promoter Score (NPS) or monthly patient satisfaction index as a loyalty early warning system. Finally, considering that the repeat visit gap is still 27% of the target (Table 1), management needs to systematically implement CRM data-based retention programs, such as control reminders, post-visit follow-ups, and personal communication.

CONCLUSION

This study examined relationships between Operational CRM, Communication CRM, patient satisfaction, and patient loyalty among 100 patients at Indera Main Clinic. Both CRM dimensions showed positive path coefficients for satisfaction and loyalty, with Communication CRM displaying the strongest association with satisfaction ($\beta = 0.586$). Satisfaction was positively associated with loyalty ($\beta = 0.375$). The reported indirect coefficients through satisfaction were 0.063 for Operational CRM and 0.220 for Communication CRM, indicating potential mediation patterns that require confirmation using complete bootstrap statistics. The findings suggest prioritizing responsive, empathetic communication while maintaining efficient administrative processes. However, the single-clinic setting, purposive sampling, and cross-sectional survey restrict generalizability and causal interpretation. Future studies should

include multiple facilities, more representative samples, and additional explanatory factors, including patient trust and perceived service quality, to strengthen evidence for healthcare relationship management.

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CONFLICT OF INTEREST

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AUTHOR CONTRIBUTIONS

Suhardiman: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing original draft. Nur Saebah: Conceptualization, Methodology, Validation, Supervision, Writing review & editing. All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

GENERATIVE AI STATEMENT

The authors declared that generative AI was used in the preparation of this manuscript. Generative AI was used to refine the language clarity and grammatical structure of the manuscript and to assist in identifying relevant recent literature; every reference suggested in this process was checked by the authors against the original publisher or DOI record before inclusion. Generative AI was not used to generate research data, perform statistical analyses, or interpret the findings; data collection, SmartPLS analysis, and interpretation were carried out by the authors. This use adhered to established ethical guidelines regarding the use and disclosure of generative AI in scholarly research. Each author has provided substantial intellectual contributions to the work, has reviewed all AI-assisted text for accuracy, and assumes full responsibility for the integrity and final content of the manuscript.

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