Laboratory Staff Communication and Patient Perception of Care: The Mediating Effect of Patient Understanding in Public Hospitals

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ABSTRACT

Effective communication is a critical component of healthcare services, as it enhances patient understanding and shapes perceptions of care quality. Laboratory departments, as medical support units, interact directly with patients, particularly during the pre-analytical phase, making the quality of laboratory staff communication essential. This study aims to examine the effect of laboratory staff communication, represented by clarity and empathy, on patient perception of care, with patient understanding of laboratory procedure as a mediating variable. A quantitative approach with a cross-sectional survey design was employed. Data were collected from 251 patients who received laboratory services at a Type C public hospital in Indonesia and analyzed using Partial Least Squares-Structural Equation Modeling (PLS-SEM). The results indicate that empathy has a positive and significant effect on patient understanding of laboratory procedure, whereas clarity does not show a significant effect. Furthermore, clarity, empathy, and patient understanding of laboratory procedures significantly influence patient perception of care. These findings highlight that empathetic communication plays a key role in improving patient understanding, while communication clarity strengthens positive perceptions of laboratory service quality. This study provides practical implications for hospital management to enhance laboratory staff communication competencies as part of quality improvement strategies.

Keywords*: Clarity, Empathy, Patient Perception, Patient Understanding, Staff Communication.*

INTRODUCTION

Effective communication has long been recognized as a fundamental driver of healthcare service quality, extending beyond clinical performance to influence patients' experiences and perceptions of the care they receive. Evidence from patient safety research consistently indicates that communication breakdowns remain one of the leading contributors to safety incidents and patient dissatisfaction within healthcare settings (WHO, 2017). Consequently, communication should no longer be regarded as a supplementary element of care delivery, but rather as a core professional competency that shapes the overall quality of healthcare services (O'Tolle, 2024).

Health communication theory conceptualizes interactions between healthcare professionals and patients as a multidimensional process that extends beyond the mere transfer of information (Nimmon & Regehr, 2018). These interactions encompass a cognitive dimension, which concerns the clarity and accuracy of information, as well as an affective dimension that reflects empathy and attentiveness to patients' emotional states (Moudatsou et al., 2020; Chen et al., 2025). When these dimensions are not adequately balanced, communication may function only at a surface level. In such situations, patients may receive medical explanations without fully grasping their significance or feeling meaningfully engaged in the care process.

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Within hospital service systems, laboratory departments serve a strategically important yet often underestimated role. Although laboratory staff interact directly with patients, particularly during the pre-analytical phase, their contribution to patient experience is frequently overlooked in health communication research. This phase, however, represents a critical moment in which patients begin to form initial judgments about hospital services. Prior studies by Meyer et al. (2021) and Dahm et al. (2023) suggest that patients commonly experience uncertainty regarding the purpose, procedures, and implications of laboratory examinations when information is delivered in ways that are unclear, inconsistent, or insufficiently empathetic. Such communication gaps may heighten patient anxiety and gradually erode trust, ultimately shaping less favorable perceptions of service quality (Shan et al., 2016; Linscott & Occhipinti, 2024; Kavas et al., 2025; Yaseen et al., 2025).

Research by Hepburn (2021) and Alreshidi et al. (2024), focusing on communication clarity, has demonstrated that information presented in a structured, consistent, and comprehensible manner can support patient understanding and reduce uncertainty during healthcare encounters. Nevertheless, clarity alone does not fully address the relational aspects of care. In the absence of empathetic engagement, patients may still perceive themselves as passive recipients rather than active participants in healthcare services (Ismail & Al-Moghrabi, 2023; Alanazi et al., 2024). Empirical evidence indicates that empathy plays a substantial role in fostering patient satisfaction and adherence, primarily through the development of trust and sustained patient involvement in the care process (Kim & Park, 2008; Alshammari et al., 2024; Patel et al., 2024).

In laboratory services, patient understanding of laboratory procedures emerges as a pivotal cognitive mechanism linking staff communication to patients' evaluations of care. Patients who comprehend the rationale, sequence, and potential implications of laboratory testing tend to report more positive perceptions of service quality and demonstrate greater confidence in healthcare systems (Boyd et al., 2007; Money et al., 2015; Pokharel et al., 2024). Despite its importance, patient understanding has predominantly been treated as an end outcome in prior studies, rather than as an explanatory mechanism through which communication influences patient perceptions.

A critical review of the literature further reveals that existing research remains heavily concentrated on physician–patient and nurse-patient interactions. Communication involving laboratory staff, who function as non-clinical actors with direct patient contact, has received comparatively limited scholarly attention. Moreover, empirical models that simultaneously integrate cognitive aspects of communication, such as clarity, with affective components, such as empathy, to explain patient perception of care remain scarce, particularly within the context of Type C public hospitals in Indonesia. Responding to these theoretical and empirical gaps, the present study examines how clarity and empathy in laboratory staff communication influence patients' perceptions of care, with patients' understanding of laboratory procedures conceptualized as a mediating variable. By focusing on laboratory services, this study extends the scope of health communication research and offers a conceptual contribution by clarifying the psychosocial pathways through which communication practices shape patients' perceptions of hospital service quality.

LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

The Influence of Clarity and Empathy on Patient Perception of Understanding

Interpersonal communication theory posits that message clarity constitutes a fundamental prerequisite for information to be cognitively received and processed by its recipient (Yoo et al., 2021). From the perspective of Uncertainty Reduction Theory, individuals actively seek clear and well-structured information to minimize uncertainty, particularly in healthcare contexts. Consistent with this view, behavioral health theories emphasize that patients' understanding of medical information is strongly influenced by how it is communicated, including the use of accessible language, systematic presentation, and contextual relevance (Aggarwal et al., 2016; Ben-Arye et al., 2024).

Accordingly, clarity can be conceptualized as a key cognitive determinant in enhancing patients' understanding of laboratory procedures. Empirical evidence supports this proposition, as clear communication significantly improves patients' comprehension of test results and procedural steps, while structured and patient-oriented communication reduces confusion and enhances overall understanding (Hattangadi et al., 2020; Zhang et al., 2020; Mee & Schaper, 2024).

Furthermore, within health communication theory, empathy is conceptualized as an affective dimension that influences the effectiveness of information reception (Paulus, 2023; Riaz et al., 2025). Therapeutic relationship theory suggests that empathetic communication enables patients to feel acknowledged and heard, thereby increasing openness and cognitive readiness to receive and understand medical information (Street et al., 2009; Moudatsou et al., 2020). As patient anxiety decreases and engagement increases, empathy functions as an affective mechanism that strengthens understanding of medical procedures. Empirical findings by Kim and Park (2008) and Nembhard et al. (2022) corroborate this relationship, indicating that healthcare provider empathy is positively associated with patient understanding and overall care experiences, and enhances understanding through increased trust and bidirectional interaction. Therefore, empathy represents a critical determinant in improving patients' understanding of laboratory procedures.

H1: Clarity has a positive effect on patient understanding of laboratory procedures.
H2: Empathy has a positive effect on patient understanding of laboratory procedures.

The Influence of Clarity and Empathy on Patient Perception of Care

From the perspective of service evaluation theory, perceptions of service quality are shaped by evaluations of service processes, including the clarity of communication delivered to service users (Parasuraman et al., 1988). Within health communication theory, clear information delivery enhances transparency, reduces uncertainty, and reinforces perceptions of professionalism and provider competence (Schiavo, 2014; Ellyamurti & Arianto, 2025). In the context of laboratory services, clarity enables patients to better understand examination procedures, which in turn promotes more favorable evaluations of care quality. Empirical evidence supports this relationship, as clarity in laboratory communication is significantly associated with positive patient perceptions of hospital services and improves overall service quality ratings (Iloh et al., 2021; Bogale et al., 2015; Pokharel et al., 2024). Thus, clarity serves as an important determinant in shaping patient perceptions of care.

On the other hand, empathy constitutes a central component of patient-centered care and plays a crucial role in shaping perceived service quality. Therapeutic relationship theory identifies empathy as a foundational element in establishing effective interpersonal relationships between healthcare providers and patients (Moudatsou et al., 2020). From the perspective of social health theory, affective dimensions such as empathy directly influence patients' subjective evaluations of care (Neumann et al., 2009; Weilenmann et al., 2018). Through empathetic interactions, patients perceive care as more humane, respectful, and responsive to their needs. Empirical studies consistently support this relationship, demonstrating that provider empathy significantly influences patient perceptions of service quality and care experiences, and enhances positive perceptions regardless of the complexity of medical interventions (Wilson et al., 2018; Hardie et al., 2022; Cadet & Sainfort, 2023). Therefore, empathy represents a key determinant of patient perception of care.

H3: Clarity has a positive effect on patient perception of care.
H4: Empathy has a positive effect on patient perception of care.

Patient Understanding of Laboratory Procedures on Patient Perception of Care

Behavioral health theory posits that individuals' understanding of medical actions significantly shapes their attitudes, trust, and evaluations of healthcare. From a health communication perspective, patient understanding functions as a cognitive mechanism that connects the quality of communication to outcomes related to service evaluation. Effective communication between healthcare providers and patients enhances comprehension of procedures, which in turn influences how patients interpret and respond to medical services (Wanzer et al., 2004). When patients clearly understand the purpose, process, and implications of medical actions, they are more likely to feel confident and reassured, reducing uncertainty and perceived risk. This cognitive processing facilitates the formation of informed judgments regarding the quality of care, allowing patients to evaluate service encounters more accurately. Consequently, patient understanding acts as a pivotal link between the strategies employed by healthcare professionals and the resulting perceptions of care, highlighting the importance of clarity and transparency in medical interactions (Franklin et al., 2018).

Empirical evidence supports the critical role of patient understanding in shaping perceptions of care. Boyd et al. (2007) and Inaray et al. (2024) reported that patients who comprehended medical procedures exhibited higher satisfaction and more favorable evaluations of care quality. Similarly, more recent research by Al-Worafi (2023) and Mee and Schaper (2024) demonstrates that enhanced understanding of laboratory procedures and test results is positively associated with perceptions of care quality and trust in healthcare providers. These findings collectively underscore that patient understanding of laboratory procedures is not merely a passive outcome of communication but an active determinant of how patients perceive and evaluate the healthcare experience. By facilitating accurate interpretations and reducing uncertainty, improved comprehension contributes to more positive attitudes toward healthcare services and reinforces trust between patients and providers, ultimately strengthening overall patient satisfaction (Agbi et al., 2023).

H5: Patient understanding of laboratory procedures has a positive effect on patient perception of care.

The Mediating Effect of Patient Understanding of Laboratory Procedures

Within health communication frameworks, patient understanding of laboratory procedures is theorized to serve as a cognitive mechanism linking information clarity to patients' evaluations of service quality. Clear and well-organized communication enables patients to grasp the purpose, stages, and implications of laboratory examinations, thereby shaping their perceptions of provider professionalism and overall service quality (He et al., 2025). Recent evidence suggests that clearly structured information delivery is essential for enhancing patient comprehension, which in turn contributes to more positive evaluations of healthcare services (Mandagi et al., 2024; Goldstein et al., 2024). Based on this evidence, it is proposed that patients understand functions as a mediating variable, facilitating the translation of informational clarity into more informed and rational patient assessments of care.

In addition to cognitive dimensions, empathy represents a critical affective communication component that fosters psychological safety and patient engagement in the healthcare encounter (Dietl et al., 2023). Empathetic communication enhances emotional comfort and supports patients' readiness to receive and process medical information, including details about laboratory procedures. Empirical research indicates that healthcare provider empathy significantly contributes to improved patient understanding and overall care experiences (Fenn et al., 2022; Winter et al., 2022). Accordingly, patient understanding is posited as a mediator through which empathy influences patients' perceptions of care, suggesting that affective communication enhances cognitive processing, which in turn leads to more favorable evaluations of service quality.

H6: Patient understanding of laboratory procedures mediates the effect of clarity on patient perception of care.
H7: Patient understanding of laboratory procedures mediates the effect of empathy on patient perception of care.

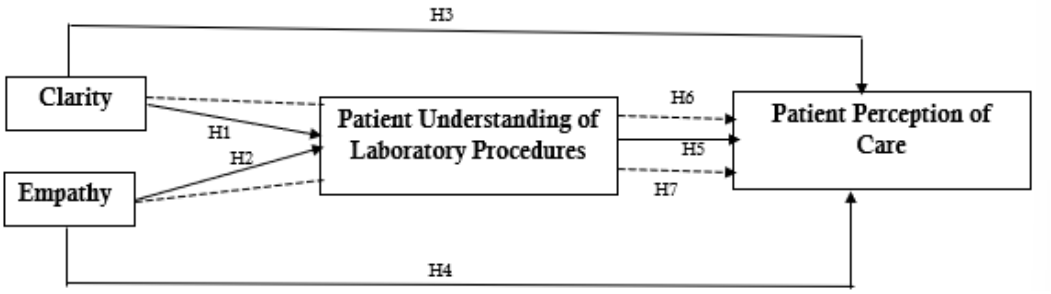

Figure 1. Conceptual Framework

Figure 1 presents the conceptual model where clarity and empathy influence patient perception of care, with patient understanding of laboratory procedures as a mediator. Clarity and empathy are proposed to affect patient understanding (H1 and H2), which in turn directly influences patient perception of care (H5). The dashed lines represent the mediating effects, where patient understanding links clarity and empathy to patient perception (H6 and H7). In addition, direct effects of clarity and empathy on patient perception are also proposed (H3 and H4), indicating both direct and indirect relationships in the model.

RESEARCH METHODS

This study employed a quantitative research approach with a cross-sectional design to examine the relationships among variables in the proposed research model. This design was chosen because it enables empirical hypothesis testing and the analysis of both direct and indirect relationships among constructs derived from health communication and health behavior theories (Hair et al., 2017). Data were collected at a single point in time after respondents had completed laboratory services, ensuring that survey responses reflected their immediate experiences. Within the research model, clarity and empathy were specified as independent variables, patient understanding of laboratory procedures served as a mediating variable, and patient perception of care was treated as the dependent variable. The cross-sectional design was considered appropriate for testing predictive and mediational relationships using Partial Least Squares Structural Equation Modeling, which is suitable for theory-based and prediction-oriented models.

The study was conducted at RSUD OKU Timur, a public Type C hospital in South Sumatra Province, Indonesia, which provides diagnostic services for both outpatient and inpatient populations. The study population consisted of patients who had undergone laboratory examinations within the previous three months and had direct interactions with laboratory staff. Participants were selected using purposive sampling with inclusion criteria requiring respondents to be at least 18 years old, to have received explanations of laboratory procedures, and to voluntarily agree to participate. A total of 251 respondents were included in the final analysis, a sample size considered adequate for Partial Least Squares Structural Equation Modeling (Hair et al., 2017).

Data were collected using a structured questionnaire adapted from established instruments in previous studies and adjusted to the hospital laboratory context. The questionnaire comprised two sections: demographic information and measurement items assessing clarity, empathy, patient understanding of laboratory procedures, and patient perception of care. All constructs were measured on a seven-point Likert scale. To reduce

recall bias and enhance validity, questionnaires were administered immediately after patients received laboratory services.

Data analysis was conducted using Partial Least Squares Structural Equation Modeling with SmartPLS version 4. This technique is well-suited for predictive and exploratory research involving multiple latent constructs and mediating relationships and does not require strict assumptions of multivariate normality (Hair et al., 2017). The analysis followed a two-stage procedure: first, the measurement model was evaluated to assess construct reliability and validity using indicator loadings, Cronbach's alpha, composite reliability, average variance extracted, and the heterotrait-monotrait ratio. Second, the structural model was assessed to examine the significance of hypothesized relationships using bootstrapping, path coefficients, and coefficients of determination. This procedure enabled a comprehensive evaluation of the explanatory and predictive performance of the proposed research model.

The study adhered to ethical principles, with voluntary participation, clear information about study objectives and procedures, and informed consent obtained from all respondents. Data were anonymized and used solely for academic purposes. The study received formal approval from RSUD OKU Timur management and complied with relevant ethical standards for health research in Indonesia.

RESULTS

A total of 251 respondents participated in this study, all of whom were patients who had received laboratory services at RSUD OKU Timur. As shown in Table 1, most respondents were aged 29–44 years (48.5%), followed by those aged 45–60 years (30.3%). Female respondents constituted the majority of the sample (61.0%).

In terms of educational background, the largest proportion of respondents held a bachelor's degree (40.2%). Most participants were employed full-time (31.9%) and were married (74.1%). Regarding visit frequency, nearly half of the respondents had visited the laboratory once (47.0%), while 35.9% reported visiting between two and five times. The purposes of visits were relatively evenly distributed, with the highest proportions associated with physician referrals (24.7%) and routine examinations (22.3%). The majority of respondents were covered by the National Health Insurance (*Badan Penyelenggara Jaminan Sosial*/BPJS) (67.3%), and more than half reported traveling a distance greater than 10 km from their residence to the laboratory (62.9%).

Table 1. Respondent Demographic Profiles

Demographic Variables	Category	Sample (n)	Percentage (%)
Gender	Male	98	39.0
	Female	153	61.0
Age	13–28 years	50	20.0
	29–44 years	122	48.5
	45–60 years	76	30.3
	61–79 years	2	0.8
	>79 years	1	0.4
Education	Not completed elementary school	6	2.4
	Elementary school	33	13.1
	Junior high school	12	4.8
	Senior high school	52	20.7
	Diploma (D1/D2/D3)	45	18.0
	Bachelor's degree (S1)	101	40.2
	Postgraduate (S2/S3)	2	0.8
Occupation	Part-time employee	36	14.3
	Full-time employee	80	31.9
	Student	10	4.0
	Retired	9	3.6
	Not working	40	15.9
	Others	76	30.3
Marital Status	Single	55	21.9
	Married	186	74.1

Demographic Variables	Category	Sample (n)	Percentage (%)
	Divorced	6	2.4
	Others	4	1.6
Visit Frequency	One visit	118	47.0
	2–5 visits	90	35.9
	>5 visits	43	17.1
Purpose of Visit	Specific disease examination	55	21.9
	Routine check-up	56	22.3
	Doctor referral	62	24.7
	Others	78	31.1
Insurance Ownership	No insurance	80	31.9
	National Health Insurance (BPJS)	169	67.3
	Private Insurance	2	0.8
Distance to Laboratory	< 5 km	26	10.4
	5–10 km	67	26.7
	> 10 km	158	62.9

Descriptive analysis indicated that all study variables obtained high mean scores, generally falling within the range of agreement to strong agreement. The clarity construct yielded a mean score of 6.17, suggesting that patients perceived laboratory procedures and examination-related information as being communicated clearly and in an understandable manner. Similarly, empathy received a favorable evaluation, with a mean score of 6.14, reflecting patients' perceptions of emotional support and attentiveness demonstrated by laboratory staff.

Patient understanding of laboratory procedures also showed a high mean score (6.16), indicating that respondents felt they adequately understood the objectives and stages of the laboratory procedures they underwent. Among all constructs, patient perception of care recorded the highest mean score (6.20), reflecting a very positive overall evaluation of laboratory service quality. These findings suggest that both laboratory staff communication and patient understanding were perceived at a very high level.

Table 2. Reliability and Validity Analysis

Variable	Item	Loading factor	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Clarity	C1	0.952	0.985	0.987	0.918
	C2	0.966			
	C3	0.957			
	C4	0.922			
	C5	0.971			
	C6	0.974			
	C7	0.964			
Empathy	E1	0.867	0.980	0.982	0.846
	E10	0.915			
	E2	0.878			
	E3	0.909			
	E4	0.936			
	E5	0.946			
	E6	0.940			
	E7	0.934			
	E8	0.949			
	E9	0.923			
Patient Understanding of Procedure	P1	0.949	0.978	0.983	0.919
	P2	0.968			
	P3	0.962			
	P4	0.963			
	P5	0.951			
Patient Perception of Care	PC1	0.934	0.982	0.985	0.889
	PC2	0.963			
	PC3	0.967			
	PC4	0.939			
	PC5	0.921			

Variable	Item	Loading factor	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
	PC6	0.926			
	PC7	0.956			
	PC8	0.937			

Evaluation of the measurement model demonstrated that all indicators exhibited factor loadings exceeding the recommended threshold of 0.70, indicating strong contributions to their respective constructs. In addition, Cronbach's alpha, rho_A, and composite reliability values for all constructs were above 0.70, confirming satisfactory internal consistency. Table 2 shows that the convergent validity was further supported by Average Variance Extracted (AVE) values exceeding 0.50 across all constructs, indicating that each construct explained more than half of the variance of its indicators. These results confirm that the measurement model met the required criteria for reliability and convergent validity.

Table 3. HTMT Test

Variable	Clarity	Empathy	Patient Perception of Care
Empathy	0.920		
Patient Perception of Care	0.943	0.965	
Patient Understanding of Procedure	0.905	0.948	0.962

Discriminant validity was assessed using the Heterotrait-Monotrait Ratio (HTMT), as recommended for PLS-SEM analysis. Table 3 shows that the results showed that all HTMT values between constructs were below the threshold of 1.00, indicating acceptable discriminant validity. Although several construct pairs exhibited relatively high HTMT values, this pattern reflects a reasonable conceptual proximity among perceptual constructs within healthcare service contexts. As none of the HTMT values exceeded the critical threshold, each construct retained sufficient empirical distinctiveness and was considered suitable for subsequent structural model analysis (Henseler et al., 2015; Hair et al., 2017).

Table 4. Effect Size (f^2)

Variable	Patient Perception of Care	Patient Understanding of Procedure
Clarity	0.237	0.105
Empathy	0.229	0.685
Patient Understanding of Procedure	0.261	-

Table 4 shows that the effect size analysis revealed that empathy exerted a substantial influence on patient understanding of laboratory procedures ($f^2 = 0.685$) and a moderate influence on patient perception of care ($f^2 = 0.229$). The effects of other constructs varied within a small-to-moderate range, including the effect of clarity on patient understanding of laboratory procedures ($f^2 = 0.105$) and on patient perception of care ($f^2 = 0.237$). In addition, patient understanding of laboratory procedures demonstrated a moderate effect on patient perception of care ($f^2 = 0.261$).

Table 5. Coefficient of Determination and Predictive Power Assessment

Variable	R Square	R Square Adjusted	RMSE	MAE	Q^2 Predict
Patient Perception of Care	0.941	0.940	0.294	0.169	0.919
Patient Understanding of Procedure	0.875	0.874	0.393	0.202	0.855

The structural model exhibited strong explanatory power. Based on Table 5, the R^2 value for patient perception of care was 0.941, while the R^2 value for patient understanding of laboratory procedures was 0.875. These results indicate that 94.1% of the variance in patient perception of care and 87.5% of the variance in patient understanding of laboratory procedures were explained by the exogenous variables

included in the model. The adjusted R^2 values were closely aligned with the corresponding R^2 values, suggesting good model stability. The high R^2 values may be attributed to the perceptual nature of the constructs and the shared service encounter context, which is common in inpatient experience research.

According to Table 5, the predictive relevance was evaluated to assess the model's out-of-sample predictive capability. For patient perception of care, relatively low RMSE (0.294) and MAE (0.169) values indicated minimal prediction error, while a high Q^2predict value (0.919) reflected very strong predictive performance. Similarly, patient understanding of laboratory procedures demonstrated satisfactory predictive accuracy, with RMSE and MAE values of 0.393 and 0.202, respectively, and a Q^2 predict value of 0.855. These results suggest that the proposed model possesses strong predictive power for both endogenous constructs.

The evaluation of the structural (inner) model focused on examining path coefficients to determine the direction and significance of relationships among the study variables. Hypothesized relationships were considered statistically significant when the p-value was below 0.05. The results of the PLS-SEM hypothesis testing are summarized in Figure 2.

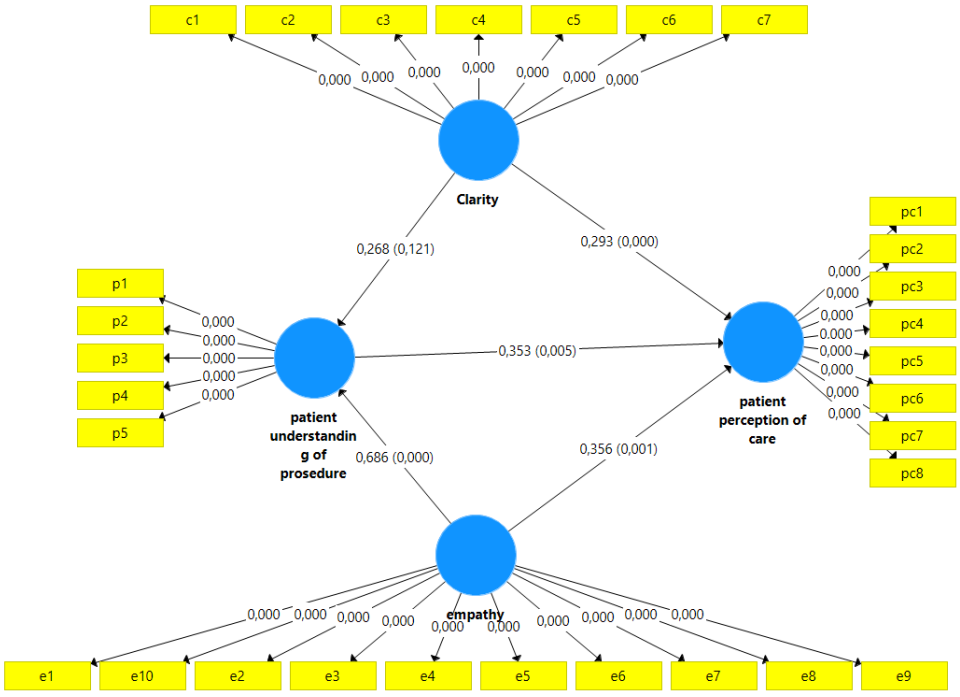

Figure 2. Inner Model

Figure 2 illustrates the structural model showing the relationships between staff communication factors, clarity, and empathy, and their effects on patient understanding of procedure and patient perception of care. Clarity positively influences perception, but patient understanding does not, while empathy strongly affects patient understanding and perception. Mediation is indicated in the pathways where patient understanding partially transmits the effect of clarity and empathy to patient perception. The values on the arrows represent path coefficients and significance levels (p-values).

Table 6. Hypothesis Test Result

Hypothesis	Hypothesis	β	p-value	Result
H1	Clarity → Patient Understanding	0.268	0.121	Not supported
H2	Empathy → Patient Understanding	0.686	<0.001	Supported
H3	Clarity → Patient Perception of Care	0.293	<0.001	Supported
H4	Empathy → Patient Perception of Care	0.356	0.001	Supported
H5	Patient Understanding → Patient Perception of Care	0.353	0.005	Supported
H6	Clarity → Patient Understanding → Patient Perception of Care	0.095	0.242	Not supported
H7	Empathy → Patient Understanding → Patient Perception of Care	0.242	0.026	Supported

Based on Table 6, the hypothesis testing results, empathy emerged as the strongest direct predictor of patient perception of care (β = 0.356), followed closely by patient understanding of laboratory procedures (β = 0.353), while clarity demonstrated a comparatively smaller yet significant effect (β = 0.293). This pattern indicates that the affective dimension of laboratory staff communication plays a central role in shaping how patients evaluate service quality. In contrast, informational clarity appears to function primarily as a reinforcing factor that strengthens patients' overall perceptions rather than as the primary driver.

Further analysis revealed that empathy exerted the most substantial influence on patient understanding of laboratory procedures, with a path coefficient of β = 0.686. This effect was markedly stronger than that of clarity, whose relationship with patient understanding did not reach statistical significance. These findings suggest that patients' comprehension of laboratory procedures is shaped more by the quality of empathetic interaction than by the technical clarity of information alone.

Examination of indirect effects provided additional insight into the underlying mechanism. Among the tested mediation paths, only the pathway from empathy through patient understanding of laboratory procedures to patient perception of care was statistically significant (β = 0.242; $p < 0.05$). The mediating role of patient understanding was not supported in the relationship between clarity and patient perception of care. This result indicates that patient understanding functions as a partial mediator, particularly in explaining how empathy translates into more favorable evaluations of care. Taken together, these findings highlight a coherent linkage between affective communication, cognitive understanding, and patient perceptions of laboratory service quality. The proposed model thus underscores the importance of empathetic communication as both a direct and indirect contribution to patients' evaluations of care within laboratory service settings.

DISCUSSION

The findings of this study highlight that laboratory staff communication, represented by clarity and empathy, plays a crucial role in shaping both patient understanding and patient perception of laboratory service quality. The results indicate that clarity in information delivery does not necessarily enhance patients' understanding of laboratory procedures (Hepburn, 2021; Mee & Schaper, 2024). This may be attributed to the technical and process-oriented nature of laboratory services, in which patients, often anxious, hurried, or focused on test results, may find it difficult to fully comprehend procedural details (Cho et al., 2024; Abraham & Junglas, 2011). In this context, clarity functions more as a signal of professionalism and service transparency, enhancing patient trust and perceived quality, rather than as a cognitive mechanism for deep procedural understanding.

In contrast, empathy is shown to play a critical role in improving patient understanding of laboratory procedures (Schiavo, 2014; Moudatsou et al., 2020). Empathetic communication fosters psychological safety, promoting openness and cognitive readiness

for processing medical information. These findings align with prior studies by Kim and Park (2008), Birhanu et al. (2010), Nembhard et al. (2022), and Campos et al. (2024) that healthcare providers' empathy enhances patient understanding and care experiences and is closely associated with patient satisfaction. Therefore, patient understanding emerges not only as a cognitive outcome but is also shaped by affective and interactive dimensions of communication.

Moreover, both clarity and empathy exert direct effects on patient perception of care. Clarity serves as an indicator of transparency and professionalism, positively influencing patient evaluations of service quality (Parasuraman et al., 1988; Sun et al., 2019; Nurhidayah et al., 2020; Rahmawati & Prasetyo, 2021; Pokharel et al., 2024). Meanwhile, empathy enables patients to feel valued and treated as individuals, enhancing subjective assessments of care (Gale et al., 2014; Wilson et al., 2018; Nembhard et al., 2022). These findings underscore the importance of affective and interactive communication, particularly in laboratory settings where interactions are brief yet highly consequential for patient experience.

Patient understanding of laboratory procedures also contributes positively to patient perception of care (Green & Kreuter, 2005; Boyd et al., 2007; Mee & Schaper, 2024). Understanding serves as a cognitive mechanism linking communication quality to service evaluation, whereby patients with greater comprehension are more likely to perceive services positively. While clarity does not mediate the relationship between communication and patient perception, empathy influences perception indirectly through enhanced understanding (Moudatsou et al., 2020; Dwijayanti et al., 2024). In other words, empathetic communication not only has a direct impact on patient perception but also strengthens cognitive processing, reduces anxiety, and increases patient engagement.

This study emphasizes that empathy is a key determinant of patient understanding and perception, whereas clarity functions as a signal of professionalism and transparency that directly shapes patient evaluations. Patient understanding emerges as an essential mechanism translating empathetic communication into positive perceptions of laboratory service quality. These findings have significant implications for laboratory practice, suggesting that staff should integrate clear communication with an empathetic approach to ensure high service quality while fostering patient trust, engagement, and procedural comprehension.

CONCLUSION

This study concludes that empathy demonstrates strong empirical support as a key antecedent of patient understanding of laboratory procedures, whereas clarity primarily influences patient perception of care directly within the context of public hospital laboratory services. The findings highlight that empathetic communication plays a central role in facilitating patients' understanding of laboratory procedures, while informational clarity contributes more directly to positive evaluations of service quality. In this respect, patient understanding functions as a cognitive mechanism linking communication quality to overall perceptions of care.

From a theoretical perspective, the proposed model contributes to the healthcare service management literature by reaffirming that interpersonal communication quality encompassing both cognitive (clarity) and affective (empathy) dimensions constitutes a strategic factor in shaping perceptions of laboratory service quality. Practically, these findings suggest that hospitals, particularly laboratory units, should move beyond a purely technical focus and systematically integrate communication competency development into their quality improvement strategies. Such efforts include delivering structured and accessible information, alongside fostering empathetic interactions that address patients' emotional and informational needs.

Several limitations of this study should be acknowledged. First, the research was conducted at a single hospital, which may limit the generalizability of the findings to other organizational contexts or patient populations. Second, the study did not differentiate among types of laboratory examinations, despite the likelihood that procedural

complexity may influence communication intensity and patient understanding. Additionally, factors such as patient privacy and waiting time, which are increasingly relevant in modern healthcare services, were not incorporated into the model. Future research is therefore encouraged to involve multiple hospitals with diverse characteristics, larger sample sizes, and additional variables to develop a more comprehensive understanding of the mechanisms shaping patient perceptions of laboratory services.

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