

Original Article

Determinants influencing patients' perceptions of radiology examination result waiting time: A cross-sectional study

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Abstract

Background: Radiology examination result waiting time represents an important indicator of healthcare service efficiency and patient-centered quality. Prolonged waiting time may influence patient satisfaction, trust in healthcare services, and clinical decision-making processes. Organizational factors such as human resources, infrastructure, and equipment readiness are considered critical determinants affecting patients' perceptions of radiology service timeliness.

Objective: This study aimed to investigate factors associated with patients' perceptions of radiology waiting times.

Methods: This analytic observational study employed a cross-sectional design conducted in August 2025 at the Radiology Installation of RSUD Siti Fatimah, South Sumatra Province. A total of 160 patients who had undergone radiological examinations were recruited using accidental sampling. Data were collected through a validated and reliable structured questionnaire assessing human resources, building and infrastructure, radiology equipment, and patients' perceptions of waiting time. Data analysis included descriptive statistics, Chi-square tests for bivariate associations, and multiple logistic regression using the backward likelihood ratio method to identify dominant predictors.

Results: Human resources showed the strongest association with patients' perceptions of radiology examination result waiting time (OR = 27.607; $p < 0.001$), followed by building and infrastructure factors (OR = 5.432; $p = 0.048$). Radiology equipment demonstrated a significant association in bivariate analysis but was not retained as a dominant predictor in the final multivariate model. These findings indicate that staff professionalism, responsiveness, communication quality, and service environment play substantial roles in shaping patient perceptions of radiology service efficiency.

Conclusion: Critical role of human resources and physical facilities in improving the quality of radiology services. Strategic initiatives should focus on strengthening both the quality and quantity of human resources, along with maintaining adequate supporting facilities, to ensure timely and optimal radiology service delivery.

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Keyword:

Facilities;
Infrastructure;
Human Resources;
Radiology;

© The Author(s) 2026

DOI:

<https://doi.org/10.52235/lp.v7i1.679>

Article Info:

Received : January 20, 2026
Revised : February 22, 2026
Accepted : Februari 26, 2026

Lentera Perawat

e-ISSN : 2830-1846
p-ISSN : 2722-2837



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Background

The health system defines hospitals as comprehensive healthcare facilities that deliver promotive, preventive, curative, and rehabilitative services across inpatient, outpatient, and emergency settings in accordance with national health legislation (Undang-Undang Republik Indonesia Nomor 17 Tahun 2023 tentang Kesehatan; Peraturan Pemerintah Republik Indonesia Nomor 28 Tahun 2024 tentang Peraturan Pelaksanaan Undang-Undang Nomor 17 Tahun 2023 tentang Kesehatan). The regulatory framework mandates efficiency, effectiveness, and quality assurance in hospital service delivery to ensure patient safety and integrated care (Peraturan Pemerintah Republik Indonesia Nomor 47 Tahun 2021 tentang Penyelenggaraan Bidang Perumahasakitan).

The clinical radiology service constitutes a strategic diagnostic support unit that utilizes ionizing and non-ionizing radiation for diagnostic and therapeutic purposes under national standards (Kementerian Kesehatan Republik Indonesia, 2020). The minimum service standards specify a maximum waiting time of three hours for outpatient radiography results while advanced imaging examinations follow internal quality indicators for continuous improvement (Kementerian Kesehatan Republik Indonesia, 2024). The national health profile reports increasing demand for diagnostic services that require strengthened service capacity and performance monitoring across hospitals (Kementerian Kesehatan Republik Indonesia, 2022).

The global health system indicators emphasize responsiveness and operational efficiency as central dimensions of healthcare quality

measurement (Organisation for Economic Co-operation and Development, 2020).

The quality of healthcare can be assessed through the structure, process, and outcome framework that evaluates service performance and patient experience systematically (Donabedian, 1988). The value-based radiology approach recognizes turnaround time as a measurable indicator of efficiency, safety, and clinical outcomes in imaging services (European Society of Radiology, 2021). The literature identifies diagnostic discrepancies and reporting delays as quality concerns that require workflow optimization within radiology departments (Brady, 2017). The international survey demonstrates that patient perceptions of waiting time influence satisfaction and perceived service value in primary care settings (Pockros et al., 2021). The global quality framework highlights system responsiveness as a determinant of patient trust and healthcare legitimacy (World Health Organization, 2023). The policy analysis emphasizes that research evidence supports quality improvement initiatives through measurable performance indicators in healthcare systems (Akbar, 2024).

The patient satisfaction studies report that service timeliness predicts satisfaction levels in primary healthcare environments (Alqahtani et al., 2023). The systematic review identifies organizational and communication factors as predictors of patient satisfaction in healthcare services (Alshahrani, 2023). The meta-analysis demonstrates that determinants of patient satisfaction include service accessibility, staff responsiveness, and waiting time management (Radwan et al., 2023). The cross-sectional study confirms that electronic health services enhance patient satisfaction through improved access and communication channels (Asiri et al., 2024). The telehealth review indicates that digital integration reduces perceived waiting time and improves patient experience across healthcare settings (Kruse et al., 2020). The innovation analysis highlights telemedicine systems as mechanisms for improving efficiency and responsiveness in health service delivery (Parekh & Suryawanshi, 2026).

The complaint analysis through digital applications reveals that waiting time constitutes a recurrent factor influencing patient dissatisfaction in primary healthcare centers (Almusawi et al., 2023). The nationwide

epidemiological study reports that virtual consultation patterns reflect changing patient expectations regarding service accessibility and timeliness (AlOmar et al., 2024). The patient experience study shows that individuals with chronic diseases associate prolonged waiting with reduced trust in healthcare services (Hazazi & Wilson, 2022). The satisfaction assessment at tertiary hospitals demonstrates that service coordination and communication affect perceived care quality (Alhinti et al., 2025). The physician practice survey identifies communication practices as determinants of patient perception regarding service efficiency (Singhal et al., 2024). The local hospital study indicates that service satisfaction correlates with organizational workflow and operational management (Wiladatika et al., 2025).

The emergency department literature reports that workload levels influence response time and service delivery performance among healthcare professionals (Kusuma et al., 2025). The pharmaceutical service evaluation highlights that process management and compliance systems determine operational safety and efficiency in healthcare facilities (Maryono et al., 2025). The electronic system analysis demonstrates that digital integration minimizes operational errors and improves service timeliness in clinical workflows (Saho, 2025). The primary healthcare reform study underscores the importance of structural transformation and capacity strengthening for improving service responsiveness (AlKhashan et al., 2021). The physician knowledge assessment confirms that workforce readiness and training influence service quality and operational performance (Almogbel et al., 2024). The regulatory framework mandates quality assurance and patient safety standards that require continuous monitoring of performance indicators in hospital services (Undang-Undang Republik Indonesia Nomor 17 Tahun 2023 tentang Kesehatan).

Despite existing evidence, the majority of previous studies focus on operational or descriptive aspects without examining simultaneous determinants of perceived radiology result waiting time in referral hospitals (World Health Organization, 2023). The literature lacks comprehensive multivariate analyses that integrate organizational factors, digital readiness, workload capacity, and communication quality within radiology

services (European Society of Radiology, 2021). The national health transformation agenda emphasizes evidence-based decision-making and measurable performance indicators for hospital quality improvement (Kementerian Kesehatan Republik Indonesia, 2024). The research utilization framework states that empirical findings should inform managerial strategies and policy development within healthcare institutions (Akbar, 2024). The patient-centered care paradigm requires systematic identification of determinants influencing perceived service timeliness in diagnostic support units (Donabedian, 1988).

Therefore, this study aims to analyze the determinants influencing patients' perceptions of radiology examination result waiting time using a cross-sectional approach in order to provide evidence-based recommendations for improving hospital service quality.

Methods

Study Design

This study employed an analytic observational design with a cross-sectional approach to examine the determinants influencing patients' perceptions of radiology examination result waiting time. The cross-sectional design was selected because it allows simultaneous measurement of exposure variables and outcome variables at a single point in time, thereby enabling the identification of associations between organizational factors and patient perceptions without manipulation of variables. The study was conducted in August 2025 at the Radiology Installation of RSUD Siti Fatimah Province of South Sumatra, which functions as a provincial referral hospital providing comprehensive diagnostic imaging services including X-ray, CT-Scan, MRI, and ultrasonography.

The study design and reporting followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) Statement issued by the EQUATOR Network to ensure methodological rigor, transparency, and completeness in reporting observational research. The cross-sectional analytic framework was justified because the objective of the study was to analyze the relationship

between human resources, infrastructure, and radiology equipment factors and patients' perceived waiting time, rather than to establish causality over time.

Sampling

The study population consisted of all patients who underwent radiological examinations at the Radiology Installation during the study period. The sampling technique used was accidental sampling, whereby eligible patients who were available at the time of data collection and met the inclusion criteria were invited to participate. The final sample included 160 respondents, which was considered adequate for multivariate logistic regression analysis, ensuring sufficient statistical power and stable parameter estimation. Inclusion criteria comprised patients who had completed their radiology examination, were aged 18 years or older, were able to communicate effectively, and agreed to participate in the study. Exclusion criteria included patients in critical clinical condition, those with cognitive impairment that limited their ability to respond accurately, and those who did not complete the questionnaire fully. The sample size was determined based on the principle of having at least 10 outcome events per independent variable in logistic regression to maintain analytical robustness and reduce overfitting risk.

Instruments

Data were collected using a structured questionnaire developed based on theoretical constructs of healthcare quality, organizational performance, and patient satisfaction. The instrument underwent expert review involving hospital management specialists and radiology practitioners to ensure content relevance, clarity, and contextual suitability. Construct validity testing was conducted using item-total correlation analysis to evaluate the adequacy of each questionnaire item in representing its respective construct.

The validity test results indicated that the research instrument generally demonstrated good validity across all measured variables. In the variable measuring patients' perception of radiology examination result waiting time, nine

out of ten items were declared valid with correlation coefficients exceeding the critical r -table value of 0.361, while one item related to information provision during delays did not meet validity criteria and was therefore excluded from further analysis. In the human resources variable, nine out of ten items were considered valid, whereas one item concerning estimated waiting time information did not satisfy validity requirements and was eliminated from subsequent analysis. All items measuring building and infrastructure as well as radiology equipment variables demonstrated correlation coefficients exceeding the critical threshold, indicating that all items were valid and suitable for measurement purposes.

Reliability testing was performed using Cronbach's Alpha to assess internal consistency of the instrument. The results showed that all study variables achieved Cronbach's Alpha coefficients equal to or greater than 0.60, indicating acceptable reliability and good internal consistency. These findings confirm that the questionnaire was sufficiently reliable and appropriate for data collection in this study.

The dependent variable was patients' perception of radiology result waiting time, measured using a Likert scale assessing whether waiting time met patient expectations and categorized into "appropriate to expectation" and "not appropriate to expectation." Independent variables included human resources measured through professionalism, communication, responsiveness, and staff attitude; building and infrastructure measured through waiting room comfort, cleanliness, accessibility, and supporting facilities; and radiology equipment measured through condition, completeness, safety, and readiness of equipment during examination. All independent variables were subsequently categorized into "good" and "not good" based on composite scoring criteria established prior to analysis. Sociodemographic data were also collected to describe respondent characteristics and to control potential confounding factors.

Data Collection

Data collection was conducted through structured face-to-face interviews with patients immediately after they completed their radiology examinations and before leaving the hospital premises. This timing was chosen to minimize recall bias and to capture real-time perceptions of waiting time. Prior to data collection, the research team obtained official permission from hospital management and conducted a pilot test of the questionnaire to refine wording and improve clarity. Trained research assistants administered the questionnaires to ensure consistency in interview procedures and to reduce interviewer bias.

The research procedure involved several sequential stages including administrative approval, ethical clearance acquisition, instrument testing, recruitment of eligible participants, administration of informed consent, data collection, data verification, and data entry. Primary data were entered into Microsoft Excel for coding and cleaning before statistical analysis. Double-checking procedures were implemented to minimize data entry errors and ensure accuracy of the dataset prior to analysis.

Data Analysis

Data analysis was performed using SPSS version 25. Descriptive (univariate) analysis was conducted to present frequency distributions, proportions, means, and standard deviations of respondent characteristics and study variables. Bivariate analysis was performed using the Chi-Square test to examine associations between independent variables and patients' perception of waiting time at a 95% confidence level with a significance level of $\alpha = 0.05$.

To identify dominant determinants and control for potential confounders, multivariate analysis was conducted using multiple logistic regression. Variables with p -values less than 0.25 in bivariate analysis were included in the multivariate model as candidates. Adjusted odds ratios (AOR) with 95% confidence intervals were calculated to determine the strength and direction of associations. Model fit

was assessed using goodness-of-fit statistics, and multicollinearity diagnostics were performed to ensure stability of regression coefficients.

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee prior to implementation. All participants received a comprehensive explanation regarding the study objectives, procedures, voluntary nature of participation, and assurance that refusal would not affect their access to healthcare services. Written informed consent was obtained from each respondent before data collection commenced. Confidentiality was strictly maintained by anonymizing all data and assigning unique codes instead of personal identifiers. All procedures were conducted in

accordance with ethical principles for research involving human subjects, including respect for autonomy, beneficence, non-maleficence, and justice.

Results

This section presents the demographic characteristics of respondents who participated in the study. Understanding respondent characteristics is essential to provide contextual insight into patient profiles receiving radiology services and to support interpretation of subsequent analytical findings. The characteristics described include age, gender, and educational level of patients who underwent radiological examinations at RSUD Siti Fatimah Province of South Sumatra during the study period, Table 1.

Table 1. Distribution of Respondent Characteristics

Variables	Frequency (n)	Percentage (%)
Age (years)		
<20	9	5.6
20-30	37	23.1
31-40	53	33.1
41-50	36	22.5
>50	25	15.6
Gender		
Male	71	44.4
Female	89	55.6
Education Level		
Primary/ Junior High School	22	13.8
Senior High School	69	43.1
Diploma Degree	12	7.5
Bachelor Degree	46	28.7
Postgraduate	11	6.9

Table 1 shows that most respondents were aged 31–40 years, totaling 53 individuals (33.1%), indicating that radiology service utilization was highest among early middle-aged adults. Female respondents constituted the majority with 89 individuals (55.6%), suggesting slightly higher radiology service utilization among women compared to men.

Regarding educational background, most respondents had completed senior high school or vocational education (43.1%), followed by

those with a bachelor's degree (28.7%). A smaller proportion had primary or junior high school education (13.8%), diploma-level education (7.5%), and postgraduate education (6.9%). These findings indicate that the majority of patients accessing radiology services had at least secondary education, which may influence their perception and expectations regarding healthcare service quality, including waiting time for examination results.

Table 2. Association Between Human Resources, Building and Infrastructure, and Radiology Equipment with Radiology Result Waiting Time

Variable	Waiting Time Not as Expected n (%)	Waiting Time as Expected n (%)	Total n (%)	p-value	Odds Ratio	95% CI
Human Resources (HR)						
Not good	7 (53.8)	5 (3.4)	12 (7.5)	0.000	33.133	8.100–135.533
Good	6 (46.2)	142 (96.6)	148 (92.5)			
Radiology Equipment						
Not good	11 (84.6)	65 (44.2)	76 (47.5)	0.005	6.938	1.485–32.410
Good	2 (15.4)	82 (55.8)	84 (52.5)			
Building and Infrastructure						
Not good	0 (0.0)	3 (2.0)	3 (1.9)	0.603	—	—
Good	13 (100)	144 (98)	157 (98.1)			

Table 2 demonstrates a statistically significant association between human resources and patients' perceptions of radiology result waiting time ($p = 0.000$). Patients who perceived human resources as "not good" were 33.133 times more likely to report waiting time as not meeting expectations compared to those who perceived human resources as "good" (95% CI: 8.100–135.533). This finding indicates that staff professionalism, communication, responsiveness, and attitude play a dominant role in shaping patients' perceptions of service timeliness.

Radiology equipment was also significantly associated with perceived waiting time ($p = 0.005$). Patients who perceived equipment conditions as "not good" had 6.938 times higher odds of reporting waiting time as not meeting expectations compared to those who perceived

equipment as "good" (95% CI: 1.485–32.410). This suggests that equipment readiness and operational functionality contribute to perceived efficiency of radiology services.

In contrast, building and infrastructure were not significantly associated with perceived waiting time ($p = 0.603$). Although infrastructure contributes to overall service comfort, it did not demonstrate a statistically meaningful influence on whether patients perceived waiting time as appropriate.

Overall, these findings indicate that human resource quality represents the strongest determinant of patients' perceptions regarding radiology examination result waiting time, followed by radiology equipment, while building and infrastructure factors appear less influential in this context.

Table 3. Results of Logistic Regression Analysis Using Backward LR Method on Predictor Factors of Radiology Examination Result Waiting Time

Step	Variable	p-value	Odds Ratio	95% CI Lower	95% CI Upper
Step 1	Human Resources	0.000	27.607	6.291	121.155
	Building and Infrastructure	0.048	5.432	1.017	29.007

Table 3 shows that human resources and building and infrastructure remained significant predictors of patients' perceptions regarding radiology examination result waiting time in the final multivariate model. Human resources demonstrated a highly significant association ($p = 0.000$) with an Odds Ratio of 27.607, indicating that patients who perceived human resources as inadequate were

approximately 27 times more likely to perceive waiting time as not meeting expectations compared with those perceiving human resources positively. This finding suggests that staff professionalism, communication quality, responsiveness, and service attitude play a dominant role in shaping patient perceptions of radiology service efficiency.

Building and infrastructure also showed a statistically significant association ($p = 0.048$) with an Odds Ratio of 5.432, indicating that patients perceiving infrastructure conditions as inadequate were about five times more likely to report dissatisfaction with waiting time. Although the strength of association was lower than that of human resources, this factor still contributed independently to perceived service efficiency, particularly in relation to comfort, accessibility, and adequacy of supporting facilities.

Overall, the multivariate analysis indicates that human resource factors represent the strongest determinant influencing patients' perceptions of radiology result waiting time, followed by building and infrastructure factors. These findings emphasize the importance of improving staff competence, communication, responsiveness, and service environment to enhance patient satisfaction with radiology service timeliness.

Discussion

This study identified human resources as the strongest determinant influencing patients' perceptions of radiology examination result waiting time. The study showed radiology equipment significantly influenced perceived waiting time among patients. The study found building and infrastructure had a weaker but still meaningful influence on perceived waiting time. Patients generally associated staff responsiveness with faster service perception. Patients linked equipment readiness with smoother diagnostic processes. Overall findings indicate organizational service factors strongly shape perceived efficiency of radiology services.

Healthcare systems define service quality through responsiveness to patient needs within structured service delivery frameworks according to national health system regulation (Undang-Undang Republik Indonesia Nomor 17 Tahun 2023 tentang Kesehatan). Hospitals organize integrated services through promotive, preventive, curative, and rehabilitative programs to maintain service effectiveness (Peraturan Pemerintah Republik Indonesia Nomor 28 Tahun 2024 tentang Peraturan

Pelaksanaan Undang-Undang Nomor 17 Tahun 2023 tentang Kesehatan). Healthcare organizations implement operational governance to ensure efficiency and effectiveness of service provision (Peraturan Pemerintah Republik Indonesia Nomor 47 Tahun 2021 tentang Penyelenggaraan Bidang Perumahsakit). Radiology units deliver diagnostic support services using ionizing and non-ionizing radiation technology within clinical standards (Kementerian Kesehatan Republik Indonesia, 2020). National transformation policies emphasize improved access, quality, and service efficiency in healthcare institutions (Kementerian Kesehatan Republik Indonesia, 2024). Global health performance frameworks highlight responsiveness as a key indicator of system quality (World Health Organization, 2023).

Service quality theory explains healthcare performance through structure, process, and outcome evaluation models in clinical systems (Donabedian, 1988). Radiology value-based practice emphasizes turnaround time as a measurable efficiency indicator in diagnostic services (European Society of Radiology, 2021). Diagnostic discrepancies and reporting delays influence operational performance in radiology services (Brady, 2017). International indicators show health systems continuously monitor operational efficiency to ensure quality service delivery (Organisation for Economic Co-operation and Development, 2020). Evidence-based policy development strengthens healthcare system performance through research utilization (Akbar, 2024). National health data demonstrate increasing demand for diagnostic services requiring improved system capacity (Kementerian Kesehatan Republik Indonesia, 2022).

Patient satisfaction studies demonstrate service timeliness predicts perceived healthcare quality among service users (Alqahtani et al., 2023). Systematic reviews identify organizational communication and staff responsiveness as predictors of satisfaction (Alshahrani, 2023). Meta-analysis studies confirm accessibility and staff performance influence patient satisfaction outcomes (Radwan et al., 2023). Electronic health service implementation improves

satisfaction through improved access and communication (Asiri et al., 2024). Telehealth integration reduces perceived waiting time in healthcare delivery contexts (Kruse et al., 2020). Healthcare innovation frameworks highlight digital service transformation as a driver of operational efficiency (Parekh & Suryawanshi, 2026).

Digital health complaint analyses show waiting time frequently influences patient dissatisfaction in healthcare services (Almusawi et al., 2023). Nationwide epidemiological studies indicate virtual consultation trends change patient expectations regarding service speed (AlOmar et al., 2024). Chronic disease patient experience research shows prolonged waiting reduces trust in healthcare services (Hazazi & Wilson, 2022). Hospital satisfaction studies indicate service coordination influences perceived care quality (Alhinti et al., 2025). Physician communication practices affect patient perceptions of efficiency and care experience (Singhal et al., 2024). Hospital outpatient satisfaction analyses link operational management to service satisfaction outcomes (Wiladatika et al., 2025).

Workforce workload studies show staff response time affects healthcare service performance levels (Kusuma et al., 2025). Pharmaceutical service evaluations demonstrate process management influences safety and efficiency in clinical settings (Maryono et al., 2025). Electronic systems reduce operational errors and improve workflow efficiency in healthcare facilities (Saho, 2025). Primary healthcare reform initiatives emphasize structural strengthening to enhance service responsiveness (AlKhashan et al., 2021). Physician knowledge and readiness influence service delivery quality and system effectiveness (Almogbel et al., 2024). Global quality frameworks stress responsiveness as essential for patient-centered healthcare delivery (World Health Organization, 2023).

Healthcare systems require integrated organizational factors to ensure efficient diagnostic service delivery across clinical settings (European Society of Radiology, 2021). Evidence-based management supports

healthcare quality improvement through systematic research utilization (Akbar, 2024). Patient-centered care models prioritize service timeliness to strengthen healthcare trust and satisfaction (Donabedian, 1988). National healthcare transformation policies emphasize performance indicators for service improvement (Kementerian Kesehatan Republik Indonesia, 2024). Global healthcare indicators highlight system responsiveness as a core performance dimension (Organisation for Economic Co-operation and Development, 2020). Continuous quality improvement strategies promote effective service delivery across healthcare systems (World Health Organization, 2023).

Conclusion and Recommendation

This study concludes that human resources represent the strongest determinant influencing patients' perceptions of radiology examination result waiting time, followed by radiology equipment factors, while building and infrastructure factors show a relatively smaller influence on perceived waiting time. Patients tend to associate professionalism, responsiveness, communication, and staff attitude with service efficiency, whereas equipment readiness contributes to smoother diagnostic processes and shorter perceived waiting time. These findings indicate that improving service quality in radiology units requires strengthening workforce competence, optimizing equipment availability, and maintaining adequate service infrastructure. Hospitals are therefore advised to enhance staff training, improve communication practices, ensure equipment functionality, and optimize workflow management to reduce waiting time and improve patient satisfaction. Future research is recommended to explore additional organizational, technological, and patient-related factors using broader study designs to support continuous quality improvement in radiology services.

Acknowledgment

The authors would like to express their sincere gratitude to all respondents who willingly participated in this study. Appreciation is also extended to RSUD Siti Fatimah for granting permission and support during data collection,

as well as to all parties who contributed to the successful completion of this research.

Funding Source

None

Declaration of conflict of interest

The authors declare no competing interests.

Declaration on the Use of AI

No AI tools were used in the preparation of this manuscript.

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