The Influence of Laboratory Analyst Performance, Examination Equipment and Work Environment on Patient Satisfaction in Hospital X Through Waiting Time Efficiency Laboratory Examination Results

Kamelia Ghalib [1], Rudianto [2], Jones Zenas Rante [3], Ratnawati Prayogi [4]
[1,2,3,4] Institut Bisnis dan Multimedia Asmi Jakarta, Indonesia
Author's correspondence : *attamimikemi@gmail.com*

Abstract. *This study examines the influence of laboratory analyst performance, examination equipment, and work environment on patient satisfaction at Hospital X through the efficiency of laboratory test result waiting times. This research employs a quantitative method. The sample consists of the entire population, using a saturated sampling/census technique, which includes 15 laboratory staff and 15 patients who visited the laboratory at Hospital X, selected through a non-probability sampling technique. Data collection was conducted using a questionnaire, and data analysis was carried out using the Smart PLS 4 method. The results are as follows: 1) Laboratory analyst performance, examination equipment, and work environment do not influence the efficiency of laboratory test result waiting times. 2) Laboratory analyst performance, examination equipment, and work environment do not influence patient satisfaction at Hospital X. 3) The efficiency of laboratory test result waiting times influences patient satisfaction at Hospital*

Keywords: Performance, Laboratory, Efficiency, Satisfaction

1. INTRODUCTION

Hospitals are vital institutions in the health care system that are responsible for providing comprehensive and quality medical services to the community. Within the hospital, various departments and units collaborate to support the diagnostic, therapeutic, and rehabilitation processes of patients. One of the units that plays a crucial role in supporting medical diagnosis is the clinical laboratory.

The clinical laboratory in the hospital serves as a center for testing and analyzing biological samples, such as blood, urine, and other body tissues. The results of laboratory tests are very important for doctors in determining the right diagnosis and treatment plan for patients. Therefore, efficiency and timeliness in the laboratory examination process are aspects that are highly considered.

Patient satisfaction is one indicator of the success of health services in hospitals. Efficient waiting time for laboratory test results can increase patient satisfaction, because patients feel appreciated and receive fast and accurate service. Conversely, long waiting times can cause discomfort and dissatisfaction, which can ultimately affect patient perceptions of the overall quality of hospital services.

Hospital X is one of the private hospitals located in the city of Bogor, is a leading hospital in the city of Bogor which is in demand by the middle to upper class by the people of

the city of Bogor for 30 years. Fast, friendly and quality have become its motto. Hospital X. Has many health services such as outpatient services, inpatient, medical rehabilitation, emergency room, radiology and laboratory.

2. THEORETICAL BASIS

Management

Based on the understanding of management according to the experts above, we can conclude that the understanding of management is a process of planning, managing, organizing, and controlling various resources, including human, financial, and material, to achieve organizational goals (Swawikanti 2024 **).** Management also includes coordination and supervision activities to ensure that things that have been done can be carried out effectively and efficiently. In general, management activities are not only planning and managing, but also involve other activities such as making decisions, determining goals, allocating resources, communicating with *stakeholders* , and monitoring *progress* . Because the scope of work is quite general but broad, managers can work in various fields in the organization, such as finance, marketing, operations, to human resources.

Hospital Management

Hospital management is a process of managing resources, activities, and personnel in a hospital. This hospital management is needed so that the hospital can provide quality, safe, effective, and efficient health services so that it can provide direct benefits to the community (Harianus Zebua , 2023). The existence of effective hospital management is a commitment to providing good service care. This is also to ensure that every individual can obtain protection, health services, and treatment as they should, in line with what is stated in the 1945 Constitution.

Laboratory Management

Laboratory management is one of the efforts in managing a laboratory. A good laboratory must be equipped with various facilities to facilitate the use of the laboratory in carrying out its activities. A laboratory can be managed well is determined by several factors that are interrelated with each other.

Inspection Tools

Good facilities and equipment will support performance or services in accordance with established operational standards so that the quality of service is maintained properly, and vice versa, if the facilities and equipment are not good, it will hinder the work activities themselves (Yuansyah, R. 2021).

Waiting Time Efficiency Concept

Efficiency refers to the ability to provide optimal output with minimal input. In hospitals, efficiency can be achieved through good resource management, utilization of information technology, accurate reporting systems, and reliable risk management. This results in productive services at efficient costs . Plebani et al (2020) suggest the implementation of a point-of-care laboratory system that speeds up the examination process and reduces the waiting time for results. This increases patient and physician satisfaction. Simundic & Lippi (2017) describe the benefits of automation and robotics technology in the laboratory to produce results faster, thus supporting timely diagnosis and treatment processes. Baird et al (2018) show that the use of portable biosensors can detect biomarkers directly at the examination site, thereby accelerating clinical decisions and patient management. Laposata (2016) emphasizes the importance of integrating laboratory information systems with patient electronic medical records to speed up the test ordering process, result reporting, and medical follow-up. Lippi & Plebani (2019) conclude that significantly reducing the waiting time for laboratory results can speed up diagnosis, initiate therapy, and minimize patient care costs.

Patient Satisfaction Concept

Patient satisfaction is an important concept in healthcare management because it is directly related to the quality of services provided and patient perceptions of their experience at healthcare facilities. Garcia (2019) in his research describes various factors that influence patient satisfaction and its impact on health outcomes and patient retention.

3. RESEARCH METHODS

Types of research

This study uses a quantitative research method. According to Sugiyono (2020:16) quantitative research methods can be interpreted as research methods based on the philosophy of positivism, used to research certain populations or samples, data collection using research instruments, data analysis is quantitative/statistical, with the aim of testing the established hypothesis.

Data Analysis Methods

According to Sekaran and Bougie (2016), data analysis is the process of examining collected data to find patterns and relationships that can provide deeper insight into the phenomenon being studied. Emphasizes the use of statistical techniques to test hypotheses and find relationships between variables.

This study uses a quantitative analysis method expressed in numbers. The data obtained will be presented in tabular form to make it easier to analyze and understand the data so that the data presented is more systematic. The research data obtained will be analyzed with the help of the SmartPLS (Partial Least Squares) 4 program.

Place and Time of Research

Research Place:

The location of the research was conducted at RS.X. Bogor.

Address: Jl. Raya Pajajaran, No.219, North Bogor City, West Java.

Research Time:

Table 1
Thesis Completion Schedule

No.	Kegiatan	Mei				Juni				Juli				Agustus				September				Oktober		
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
1	Penelitian awal																							
1	Persiapan (proposal)																							
2	Studi Pustaka																							
3	Pembuatan Proposal																							
4	Seminar Proposal																							
	Pengumpulan Data																							
	Pengolahan Data																							
	Penyelesaian Bab I																							
	Penyelesaian Bab II																							
	Penyelesaian Bab III																							
	Penyelesaian Bab IV																							
	Penyelesaian Bab V																							
	Dafatar Pustaka Dan Lampiran																							
	Ujian Tesis																							

Source: Processed by the Author

4. RESULTS AND DISCUSSION

Data Analysis Results

This research was analyzed using the Structural Equation Model (SEM), with the help of PLS (Partial Least Square) software 4. Model Testing

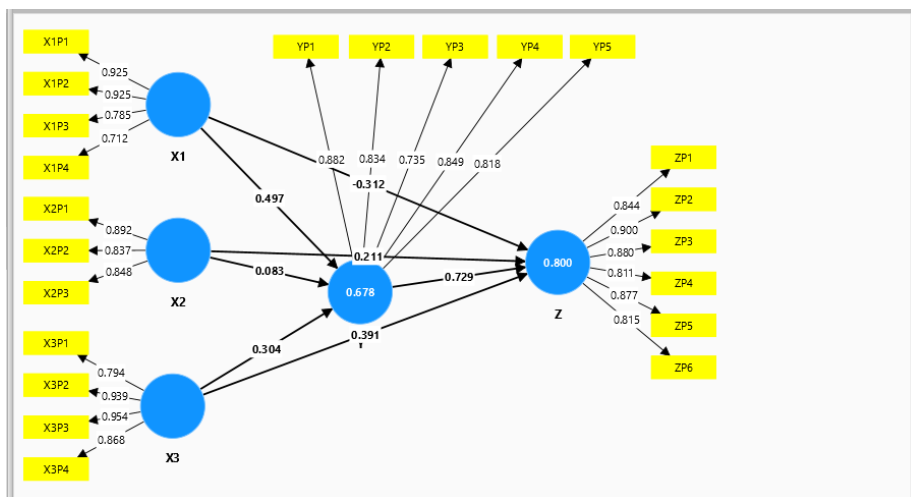stage uses the PLS Algorithm method which provides the following model output.

Figure 1 PLS Algorithm Output
Source : Data processed with SmartPLS 4, 2024

Figure 1 explains the model output based on the analysis with the PLS Algorithm method. In the SEM-PLS method there are two models, namely the outer model and the inner model. The test criteria are carried out on both models.

Outer Model Analysis

Convergent Validity Test

Convergent validity test using the *loading factor value* , an indicator is declared valid when it has a *loading factor value* > 0.7 (Ghozali, 2016). The following are the values of each indicator in the research variables:

Table 2
Convergent Validity Test

Laboratory Analyst Performance (X_1)	Outer Laoding	Validity
$X_{1.1}$	0.925	Valid
$X_{1.2}$	0.925	Valid
$X_{1.3}$	0.785	Valid
$X_{1.4}$	0.712	Valid
Inspection Tool (X_2)	**Outer Laoding**	**Validity**
$X_{2.1}$	0.892	Valid
$X_{2.2}$	0.837	Valid
$X_{2.3}$	0.848	Valid
Work Environment (X_3)	**Outer Laoding**	**Validity**
$X_{3.1}$	0.794	Valid

X 3.2	0.939	Valid
X 3.3	0.954	Valid
X 3.4	0.868	Valid
Laboratory Test Result Waiting Time Efficiency (Y)	**Outer Laoding**	**Validity**
Y 1	0.882	Valid
Y 2	0.834	Valid
Y 3	0.735	Valid
Y 4	0.849	Valid
Y 5	0.818	Valid
Patient Satisfaction At Hospital X (Z)	**Outer Laoding**	**Validity**
Z 1	0.844	Valid
Z 2	0.900	Valid
Z 3	0.880	Valid
Z 4	0.811	Valid
Z 5	0.877	Valid
Z 6	0.815	Valid

Source : Data Processed With SmartPLS version 4 (2024)

Table 2 above shows that *the Factor Loading* value above shows that it has met the requirements for convergent validity with a *Factor Loading value > 0.70 so that all of the above variables are declared valid. The validity value is also confirmed by the Average Variance Extracted (AVE)* validity test , where the value AVE must be above 0.50 (Ghozali, 2016). Which can be explained in the following table:

Table 3
AVE Convergence Validity Test

	(AVE)	**Information**
Laboratory analyst performance	0.709	Valid
Inspection tools	0.738	Valid
Work environment	0.793	Valid
Efficiency of waiting time for laboratory test results	0.680	Valid
Patient satisfaction at hospital X	0.731	Valid

Source: Data processed with Samart PLS 4 ,2024

It can be seen from Table 3 that the values of all indicators in each variable are > 0.5 so that these values have fulfilled the requirements of convergent validity.

Discriminant Validity Test

The next indicator validity test is discriminant validity, and can be evaluated with the *Cross Loading value* . It is said to be valid if an indicator has a greater correlation coefficient with each of its constructs compared to the other correlation coefficient values (Hair et al., 2017). The following is *the output* of the *cross loading* algorithm calculation PLS-SEM 4.

Table 4
Cross loadings Analysis

	Laboratory Analyst Performance	Inspection Tools	Environment Work	Efficiency of Waiting Time for Laboratory Test Results	Patient Satisfaction At Hospital X
X1P1	0.925	0.558	0.863	0.712	0.659
X1P2	0.925	0.558	0.863	0.712	0.659
X1P3	0.785	0.589	0.560	0.525	0.498
X1P4	0.712	0.092	0.700	0.745	0.654
X2P1	0.506	0.892	0.286	0.454	0.483
X2P2	0.267	0.837	0.184	0.224	0.216
X2P3	0.483	0.848	0.327	0.381	0.480
X3P1	0.802	0.505	0.794	0.613	0.702
X3P2	0.798	0.141	0.939	0.697	0.614
X3P3	0.849	0.331	0.954	0.759	0.724
X3P4	0.765	0.179	0.868	0.699	0.610
YP1	0.839	0.565	0.703	0.882	0.820
YP2	0.693	0.519	0.627	0.834	0.671
YP3	0.491	0.213	0.467	0.735	0.486
YP4	0.629	0.085	0.715	0.849	0.711
YP5	0.648	0.364	0.662	0.818	0.836
ZP1	0.637	0.495	0.754	0.773	0.844
ZP2	0.466	0.408	0.501	0.723	0.900
ZP3	0.690	0.311	0.667	0.809	0.880
ZP4	0.618	0.503	0.565	0.717	0.811
ZP5	0.740	0.617	0.619	0.741	0.877
ZP6	0.667	0.192	0.706	0.703	0.815

Source: Data processed with Samart PLS 4, 2024

Based on table 4, the results of the *cross-loading test* show that the correlation coefficient value between the same variables tends to be greater than the correlation value with different variables. This shows that the indicators in the research variables have met the requirements for discriminant validity.

Reliability Test

Reliability testing is carried out to see the level of consistency of the indicators. as instrument study, measured with *Cronbach's Alpha* and *Composite Reliability* The following are the results of the Reliability test from *Smart PLS 4.*

Table 5
Reliability Test

	Cronbach's alpha	Composite reliability	Information
Laboratory Analyst Performance	0.859	0.868	Reliable
Inspection Tools	0.830	0.878	Reliable
Work environment	0.911	0.916	Reliable
Efficiency of Waiting Time for Laboratory Test Results	0.883	0.898	Reliable
Patient Satisfaction at RS.X	0.926	0.929	Reliable

Source : Data processed with SmartPLS 4, 2024

Based on the results in the table 5 in above, can be obtained that *the Cronbach's Alpha* and *Composite Reliability values* have met the requirements with mark Which more big from 0.70 although mark 0.60 still can accepted (Hair et et al., 2017). So with the above values, all indicators of each construct are declared reliable.

Inner Model Analysis

Inner Model analysis can be carried out using the following testing methods :

Path Coefficient

The path coefficient or path coefficient is a measure that shows the strength and direction of the relationship between two latent variables. mark range between -1 until +1 (Hair, 2017). From the path coefficient value, we can find out the relationship between two variables based on the data generated from the *PLS-SEM calculation. algorithm* as follows:

Table 6
Path Coefficient

Variable Relationship	Path coefficients
Laboratory Analyst Performance →Efficiency of Waiting Time for Laboratory Examination Results	0.497
Performance of Patient Satisfaction Laboratory Analyst →at Hospital X	-0.312
Laboratory Examination Result Waiting Time Efficiency Check Tool→	0.083
Assessment Tool →at Hospital X	0.211
Working Environment →Efficiency of Waiting Time for Laboratory Examination Results	0.304
Work Environment →at Hospital X	0.391

Efficiency of Waiting Time for Laboratory Examination Results →Patient Satisfaction at Hospital X	0.729

Source : Data processed with SmartPLS 4, 2024

Based on table 6, it can be seen that the laboratory analyst performance variable has a positive influence on the efficiency of the waiting time for laboratory test results, with a path coefficient value of 0.497. This shows that the better the performance of the laboratory analyst, the more efficient the waiting time for laboratory test results. This influence is quite significant because it approaches the value of 0.5, which indicates a fairly strong positive relationship.

variable has a negative effect on patient satisfaction, with a path coefficient of -0.312. This may indicate that increasing laboratory analyst performance is not always followed by increasing patient satisfaction directly. It is possible that patient satisfaction is influenced by variables other than analyst performance, such as examination tools or work environment.

variable shows a very weak positive effect on the efficiency of waiting time for laboratory examination results, with a path coefficient of 0.083. This indicates that the effect of examination tools on waiting time efficiency is not very significant and may not be the main factor influencing the efficiency of waiting time for examination results.

variable has a positive effect on patient satisfaction, with a path coefficient value of 0.211. This shows that the examination tool contributes to patient satisfaction, but the effect is not too large. Other factors may be more significant in influencing patient satisfaction. Meanwhile, the work environment variable has a positive effect on the efficiency of waiting time for laboratory test results with a path coefficient of 0.304. This shows that a conducive work environment can help speed up the waiting time for test results, although the effect is not too large compared to the effect of laboratory analyst performance.

variable has a significant positive effect on patient satisfaction, with a path coefficient value of 0.391. This means that a good work environment can increase patient satisfaction. The work environment may include factors such as a comfortable workplace atmosphere, waiting room conditions, or friendliness of officers that also affect patient perceptions.

The variable of waiting time efficiency for examination results has the most significant influence on patient satisfaction, with a path coefficient of 0.729. This shows that the faster the waiting time for laboratory examination results, the higher the patient satisfaction. This waiting time efficiency factor appears to be the main determinant of patient satisfaction compared to other factors.

R-Square Value (R²)

R-Square or Determination Coefficient is a way to assess the predictive ability of the model that is built, namely with a larger R Square value indicating that the model has a better prediction. Classification The value of 0.75 and above indicates a strong model in explaining the dependent variable, 0.50 - 0.74 indicates a moderate model, and 0.25 - 0.49 indicates a weak model (Hair et al., 2016). The following is the calculation of the PLS-SEM algorithm for the *R Square value*

Table. 7
R-Square Determination Coefficient Test (R²)

	R-square	**R-square adjusted**
Efficiency of waiting time for laboratory test results (Y)	0.678	0.624
Patient satisfaction at hospital X (Z)	0.800	0.753

Source: Data processed by Samart PLS 4, 2024

It can be seen from table 7 above that the efficiency of waiting time for laboratory test results influences the performance of laboratory analysts, examination tools and work environment by 67.8%, the rest is explained by other variables outside this study . Likewise, the model of laboratory analyst performance, examination tools and work environment influences patient satisfaction at hospital X by 80.0%, the rest is explained by other variables outside this study.

f Square **Value (** *f ²)*

Evaluation f *Square* For evaluate contribution specific from exogenous variables to endogenous variables. The categorization of f *Square values* consists of 0.35 strong effect, 0.15 medium effect, and 0.02 weak effect (Hair et al., 2016). The following are the f Square values produced by the PLS-SEM 4 algorithm:

Table. 8
f -Square (*f ²)* Assessment

	f-square	**Information**
Laboratory Analysis Performance →Efficiency of waiting time for laboratory test results .	0.096	Moderate effect
Performance of Patient Satisfaction Laboratory Analysis →at Hospital X.	0.056	Weak effect
Laboratory test result waiting time efficiency inspection tool →.	0.013	Weak effect
assessment tool →at hospital X.	0.135	Moderate effect
Work environment →Efficiency of waiting time for laboratory test results .	0.044	Weak effect

Working environment →Patient satisfaction at hospital X.	0.113	Weak effect
Efficiency of waiting time for laboratory test results →Patient satisfaction at hospital X.	0.857	Strong effect

Source: Samart PLS data processed 2024

Based on table 8 above, it shows that the f Square value shows the contribution or relative influence of the independent variable on the dependent variable in the model as follows:

From the analysis above, it can be concluded that Waiting Time Efficiency Laboratory Examination Results are the strongest factors influencing Patient Satisfaction . Although Laboratory Analyst Performance **,** Examination Equipment **, and** Work Environment also contribute to these variables, their effects are relatively weak to moderate. This suggests that to improve patient satisfaction, the primary focus should be on improving the efficiency of waiting time for laboratory test results.

Analysis of the relationship between Laboratory Analyst Performance and Laboratory Test Result Waiting Time Efficiency

Judging from the values in the table above, the T statistic value = 0.763 < 1.645 and the P values 0.446 > 0.05. which means that the performance of laboratory analysts does not affect the efficiency of waiting time for laboratory examination results. The first hypothesis states that the influence between laboratory analyst performance and the efficiency of waiting time for laboratory test results is not significant.

Analysis of the relationship between examination tools and the efficiency of waiting time for laboratory examination results

Judging from the values in the table above, the T statistic value = 0.306 <1.645 and the P values 0.759> 0.05. which means that the examination tool does not affect the efficiency of the waiting time for laboratory examination results. the second hypothesis states that the influence between the second hypothesis of the examination tool and the efficiency of the waiting time for laboratory examination results is not significant.

Analysis of the relationship between work environment and waiting time efficiency for laboratory test results

Judging from the values in the table above, the T statistic value = 0.500 <1.645 and the P values 0.617 > 0.05. which means that the work environment does not affect the efficiency of the waiting time for laboratory examination results. The third hypothesis states that the influence between the third hypothesis of the work environment and the efficiency of waiting time for laboratory test results is not significant.

Analysis of the relationship between Laboratory Analyst Performance and Patient Satisfaction at Hospital X

Judging from the value in the table above, the T statistic value = 0.480 <1.645 and the P value 0.631> 0.05. which means that the performance of laboratory analysts does not affect patient satisfaction at hospital X. The fourth hypothesis states that the influence between the fourth hypothesis of laboratory analyst performance and patient satisfaction at hospital X is not significant.

Analysis of the relationship between examination tools and patient satisfaction at Hospital X

Judging from the values in the table above, the T statistic value = 0.694 <1.645 and the P values 0.487> 0.05. which means that the examination tool does not affect patient satisfaction at hospital X. The fifth hypothesis states that the influence between the fourth hypothesis of examination tools and patient satisfaction is not significant.

Analysis of the relationship between work environment and patient satisfaction at Hospital X

Judging from the values in the table above, the T statistic value = 0.636 <1.645 and the P values 0.525> 0.05. which means that the work environment does not affect patient satisfaction at hospital X. The sixth hypothesis states that the influence between the fourth hypothesis of the work environment and patient satisfaction at hospital X is not significant.

Analysis of the relationship between waiting time efficiency for laboratory examination results and patient satisfaction at Hospital X

Judging from the value in the table above, the T statistic value = 0.2.209 > 1.645 and the P value 0.027 < 0.05. which means that the efficiency of waiting time for laboratory test results has an effect on patient satisfaction at hospital X. The seventh hypothesis states that the influence between the seventh hypothesis of the efficiency of waiting time for laboratory test results and patient satisfaction at hospital X is significant.

5. CONCLUSION AND RECOMMENDATION

Conclusion

Based on the results of research and discussion of the influence of laboratory analyst performance, examination tools and work environment on patient satisfaction at hospital X, on the efficiency of waiting time for laboratory examination results as follows:

1. That the performance of laboratory analysts does not have a significant effect on the Y variable of the efficiency of waiting time for laboratory examination results, as evidenced

by the T statistic value = 0.763 < 1.645 and the P values 0.446 > 0.05, but the analyst's performance has a fairly moderate influence on the efficiency of waiting time for laboratory examination results as evidenced by the f square value with a value of 0.096, this shows that the laboratory analyst performance variable still has an effect on the efficiency of waiting time for laboratory examination results even though it is not a strong influence, so it is necessary to look for other factors that have a stronger influence on laboratory services.

2. That the examination tool does not have a significant effect on the variable of efficiency of waiting time for laboratory test results as evidenced by the T statistic value = 0.306 < 1.645 and the P values 0.759 > 0.05. However, the examination tool still has an effect even with a small value on the efficiency of waiting time for laboratory results as evidenced by the f square value with a value of 0.013, so it is necessary to look for other factors that can improve laboratory services.

3. That the work environment does not have a significant effect on the efficiency of waiting time for laboratory test results, which is proven by the T statistic value = 0.500 < 1.645 and the P values 0.617 > 0.05. However, the work environment still has an influence even with a small value on the efficiency of waiting time for laboratory results as evidenced by the f square value with a value of 0.044, so we must look for other factors that can improve laboratory services.

4. That the performance of laboratory analysts does not have a significant effect on patient satisfaction at hospital X, as evidenced by the T statistic value = 0.480 < 1.645 and the P values 0.631 > 0.05. However, the performance of laboratory analysts still has an effect, although with a small value, on patient satisfaction at hospital X. which is evidenced by the f square value of 0.056, so other factors must still be sought to improve patient satisfaction in laboratory services.

5. That the examination tool does not have a significant effect on patient satisfaction at hospital X, as evidenced by the T statistic value = 0.694 <1.645 and the P values 0.487 > 0.05. However, the examination tool still has an influence even with a moderate value on patient satisfaction at hospital X. which is evidenced by the f square value with a value of 0.135, which proves that this factor is quite influential when combined with other factors that support increasing patient satisfaction in patient services.

6. That the work environment does not have a significant effect on patient satisfaction at hospital X, as evidenced by the T statistic value = 0.636 < 1.645 and the P values 0.525 > 0.05. However, the work environment factor still has an influence, although with a small

value, on patient satisfaction at hospital X, as evidenced by the f square value of 0.113, which means a good work environment increases patient satisfaction in laboratory services.

7. That the efficiency of waiting time for laboratory test results has a significant effect on patient satisfaction at hospital X , as evidenced by the T statistic value = 0.2.209 > 1.645 and the P values 0.027 < 0.05. The efficiency of waiting time for laboratory test results has a strong effect on patient satisfaction at hospital X, which can be proven by the f square value of 0.857, so that this factor has a strong effect on patient satisfaction at hospital X in laboratory services.

Suggestion

1. Hospital management is expected to continue to monitor and evaluate laboratory processes periodically to identify obstacles that disrupt the efficiency of waiting times for examination results, so that improvements can be made immediately.

2. Further research is recommended to deepen understanding of other factors that may influence patient satisfaction and laboratory efficiency, such as information technology in test result management or the role of communication between analyst and patient.

6. REFERENCES

Baird, K., et al. (2018). Workplace environment and its impact on employee performance: A review. *International Journal of Productivity and Performance Management, 67* (4), 675-690.

Garcia, L. S. (2019). *Clinical laboratory management* . ASM Press.

Ghozali, I. (2016). *Structural equation modeling: An alternative method with partial least square (PLS)* . Diponegoro University Publishing Agency.

Ghozali, I., & Latan, H. (2015). *Partial least squares: Concepts, techniques and applications using the SmartPLS 3.0 program for empirical research* . Diponegoro University Publishing Agency.

Hair, J.F., Hult, G.T.M., Ringle, C.M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* . Sage Publications.

Laposata, M. (2016). *Laboratory medicine: The diagnosis of disease in the clinical laboratory* . McGraw-Hill Education.

Plebani, M., et al. (2020). Reducing wait times in clinical laboratories. *Clinical Chemistry, 66* (3), 476-482.

Simundic, A. M., & Lippi, G. (2017). Managing the preanalytical phase to reduce laboratory errors. *Clinical Chemistry and Laboratory Medicine, 55* (3), 415-423.

Sugiyono, Prof. Dr. (2020). *Quantitative, qualitative, and combination research methods* (4th ed .). Alfabeta.

Swawikanti, K. (2024). Understanding management, definition, goals, elements, and functions. *Brazen Academy* .

Yuansyah, R., Harahap, J., & Begum, SR (2021). Analysis of factors affecting waiting time for clinical laboratory test results at Dr. RM'Djoelham Regional Hospital, Binjai City in 2020. *Journal of Healthcare Technology and Medicine, 7* (2).