Exploring the Determinants of Patient Satisfaction in Emergency Healthcare: Evidence from Irish EDs

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Exploring the Determinants of Patient Satisfaction in Emergency Healthcare:

Evidence from Irish EDs

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Abstract

Background Patient satisfaction is a crucial indicator of healthcare quality, particularly in emergency departments (EDs), and it influences both clinical outcomes and institutional reputation. In Ireland, despite the significant challenges faced by these settings, including long waiting times and resource constraints, patient satisfaction in EDs has not been thoroughly explored. This article aimed to determine the key indicators influencing patient satisfaction in an Irish Emergency Department (ED).

Methods This study was conducted in the ED of an adult teaching hospital in Ireland utilizing a patient satisfaction survey distributed to individuals aged 16 years and older who visited the ED. The patient satisfaction determinants were evaluated by estimating multivariate models using PLS analysis to test hypotheses and examine the associations between patient satisfaction dimensions and overall patient satisfaction as a dependent outcome measure.

Results The analysis revealed that patient satisfaction is significantly and positively influenced by the dimensions of information, responsiveness, and assurance. These findings are crucial for understanding and improving healthcare quality. Interestingly, reliability was found to have a negative impact on patient satisfaction. However, it was also found to play a mediating role in the relationship between information and patient satisfaction, highlighting the complex dynamics of patient satisfaction. The dimensions of tangibility and empathy were not significantly associated with overall satisfaction. The expected mediating effect of responsiveness on reliability and satisfaction was not supported.

Conclusion The findings of this study offer valuable insights for healthcare providers and policymakers. By emphasising the critical importance of improving the quality of information provided to patients, addressing issues related to reliability, and enhancing responsiveness, this study provides practical guidance for enhancing patient satisfaction in emergency care settings. These factors are crucial in meeting patient expectations and boosting overall satisfaction. Continuous monitoring and targeted interventions are recommended to ensure that patient satisfaction levels are maintained and improved in the dynamic environment of

emergency care. Implementing these strategies can lead to better patient experiences, improved clinical outcomes, and a stronger institutional reputation.

Keywords: Patient satisfaction; Emergency Department; Quality of healthcare; Partial least squares structural equation modeling (PLS-SEM)

Background

The major shift in the expectations of taxpayers from hospitals has attracted the attention of healthcare decision-makers. Patient satisfaction has also taken on great importance as a measure of quality healthcare delivery. Over the past decade, gauging patient satisfaction has been a growing priority, with great concern for healthcare providers ensuring that patient satisfaction is met (Ferreira et al., 2023). It has also become one of the critical dimensions of quality and part of financial incentives and public reporting requirements (Omaghomi et al., 2024). Excellence in healthcare settings is measured by health outcomes as well as patient satisfaction (Novitasari, 2022).

In today’s competitive healthcare market, managers cannot afford to neglect patient satisfaction scores because more satisfied patients are more likely to recommend hospitals to family and friends (Atsavapranee et al., 2024). Therefore, monitoring patients' perceptions is a fundamental strategy for planning improvement (Han et al., 2020). Hence, healthcare organisations and systems today are under mountain pressure to improve the quality of care provided while minimizing costs (Bhat et al., 2020). Furthermore, the healthcare system is considered one of the most complex because of its high variability and uncertainty (Alowad et al., 2020). In response to ubiquitous healthcare complexities, healthcare leaders seek effective tools and

methods to provide practical solutions (Okolo et al., 2024) that positively impact patient satisfaction.

Poor patient satisfaction profoundly affects the clinical and financial outcomes of healthcare systems. It undermines patient compliance, leading to poorer clinical outcomes, lower care quality, higher readmission rates, increased medicolegal risk (Sonis et al., 2019) and/or death within 6 months postdischarge (Anderson et al., 2020). For instance, studies show that in hospitals with low patient satisfaction scores, the readmission rate jumped from 5.6% at 30 days to 23.3% at 180 days (Hughes and Witham, 2018).

Over the past decade, a growing global interest in patient satisfaction has been growing. In the United States (US), significant mandatory changes were made to the payment program for all U.S. hospitals. As of 2023, hospital reimbursements are linked to patient experience and the quality of healthcare services, and the payment program model is based on four measures: patient experience, the process of service delivery, mortality rates, and readmission rates (Poorani et al., 2023).

As in other service industries, healthcare must be consumer focused rather than provider focused (Park et al., 2022). For instance, researchers have suggested that patient- and family-centered care involves a mutually beneficial partnership with healthcare providers, patients, and families. As a result, patient input is essential for determining whether patients’ needs are met. From this perspective, it is necessary to view care through patients' eyes to understand their expectations and satisfaction (Alibrandi et al., 2023). However, this has not always been the case, and improvement based on patient feedback rarely materializes (Sheard et al., 2019). Hence, addressing patient satisfaction factors is vital to ensuring an organization's

performance. Unfortunately, identifying these factors alone is not sufficient. Once patient satisfaction is determined, the next critical step is to employ those results to improve the services provided.

Since 2009, patient satisfaction has significantly impacted healthcare hospital funding in the United Kingdom (UK). Patients must review their experiences as part of their quality and performance reporting. Up to 10% of the payments to National Health Service (NHS) Trusts will eventually depend on reported adequate patient satisfaction levels. The proportion of service funding is contingent on achieving improvements in patient-reported experiences (Department of Health, UK, 2018).

In Ireland, in 2019, the Health Service Executive (HSE) was established on January 1, 2005, by the Health Act of 2004, and officially began operation on January 1, 2005. Health services were taken over by 11 regional health boards (Saul, 2024). Despite all the efforts made to improve the healthcare system in Ireland, many challenges remain and require extra effort related to long waiting hours, shortages of beds and budgets. Furthermore, the National Care Experience Program was established to improve health and social care service quality by asking people about their care experiences. The program is a partnership between the Health Information and Quality Authority (HIQA), the Health Service Executive (HSE), the Department of Health, and patient representatives (Beecher et al., 2021).

Accordingly, the Irish National Inpatient Experience Survey provides a clear picture of the quality of acute healthcare services for inpatients in Ireland, as reported by patients. However, patient feedback in the emergency department is not utilized to drive improvements, as no survey has been developed to explore patients' satisfaction levels in the emergency department in Ireland. Accordingly, this study

aimed to examine the determinants of patient satisfaction in emergency departments in acute hospital contexts in Ireland.

Materials and Methods

Study Setting

The study was conducted in Ireland's Emergency Department (ED) of Adult Teaching Hospital. The selected hospital has one of Ireland's largest and busiest EDs. Obtaining the executive team's approval was crucial to successfully start the project. Accordingly, the initiating phase, which lasted for three weeks, began with a meeting with the hospital's Chief Executive Officer and Chief Operation Officer, followed by several meetings with ED stakeholders, including consultants and head nurses. The project's scope and expected outcome were agreed upon during these meetings. The project challenges were also discussed to help the project progress and hinder these challenges successfully.

The ED serves approximately 50,000 patients a year and continues to grow in patient volume. Between 2012 and 2023, there was a 22% increase in the annual volume of patients attending the ED without increasing resources or capacity. In 2012, 43576 patients visited the ED, while more than 52000 patients did so in 2023. The satisfaction questionnaire survey was mailed to patients older than 16 years visiting the ED whether they were admitted or not. This survey has 32 questions, with 3 asking about patient characteristics. The remaining questions asked the patients to rate their satisfaction with the care and service. The last question asked the patients to rate their overall satisfaction with care.

Survey instrument

A patient satisfaction questionnaire was developed based on an exploratory study (Swallmeh et al., 2018) and a literature review. The patient satisfaction questionnaire contains 24 questions. The questions asked the patients to rate their satisfaction with the care and service. Patient satisfaction was assessed with a five-point Likert scale ranging from “very poor” to “excellent”. Finally, one question asked the patients to rate their overall satisfaction with the hospital on a scale ranging from very poor to excellent. Patient responses are correlated with overall satisfaction to determine which satisfaction dimension has the most vital relationship with overall satisfaction.

The questions in the questionnaire concern the following dimensions: information, reliability, empathy, tangibility, assurance, and responsiveness.

1. **Information**: All survey questions focused on patients' perceptions of the information provided during their visit. This includes information related to delays and waiting times for treatment. It also explains laboratory results, home-care instructions, information delivery in a language patients can easily understand, and the signage used in the healthcare facility.
2. **Reliability:** This factor addresses all issues related to waiting times during patients' healthcare facility visits. The survey also included questions related to privacy and confidentiality.
3. **Empathy:** Questions address the healthcare team's considerations of respect and dignity.
4. **Tangible:** Questions related to the physical setting, such as the comfort of the waiting room, unit cleanliness, and availability of healthy food.

5. **Assurance:** These questions focus on the friendliness of the healthcare staff and whether consent is requested before diagnostic procedures are undertaken.
6. **Responsiveness:** Patients' expectations and assessments of the healthcare team's willingness to answer questions from patients and their family members about how their pain is controlled.

The sample size is determined using Slovin's formula (Slovin, 1960), $n=\frac{N}{(1+Ne^2)}$, where

N= the size of the population.

E= margin of error

Using a 95% confidence interval in a sample size method (Nanjundeswaraswamy and Divakar, 2021), Slovin's formula computes the minimum number of samples needed to meet the desired statistical constraints (Mgaya and Gwahula, 2024).

Content validity has also been assessed to confirm language clarity, practical relevance, and theoretical relevance in the Irish context (De Barros Aherns et al., 2020). Correspondingly, a panel of four members with recent hospital experience, two healthcare managers and two academics were asked whether the questionnaires measured the concept. Furthermore, experienced healthcare and academic teams are requested to assess face-to-face content validity to determine the appropriateness and relevance of the questions to the research questions. A pilot study was conducted over one week to ensure that the participants understood the questions clearly and quickly. The participants were asked to identify difficult questions.

The patient satisfaction questionnaire was mailed to the patients who attended the healthcare facility two weeks after they visited the Adult Emergency Department.

The two weeks were selected to ensure that the participants remembered the details of their visit to the healthcare facility. Although using other methods of questionnaire delivery, such as phone surveys, might have a higher response rate, patients may have been more apt to report higher levels of satisfaction than using a more anonymous survey method, such as a mailed survey (Morgan et al., 2015). Furthermore, a mailed survey would encourage patients to rate their satisfaction openly and avoid possible threats to patient confidentiality and susceptibility to bias. Survey alert letters are sent to improve response rates and assure potential respondents that the research is legitimate and high quality (Frandell et al., 2021). Postage-paid return envelopes were sent to randomly selected patients to encourage the participants to complete the questionnaires and avoid visiting the post office.

An information leaflet and consent form explaining the research purposes were mailed along with the questionnaire. The information leaflets contain a complete explanation of the study, including its aim, purpose, methods and procedures for data collection and the process for protecting their identity. Ethical approval was obtained from the ethics committee of the participating hospital before conducting the study.

Statistical analysis

Previous studies have shown that structured equation modeling (SEM) is a crucial tool for healthcare managers and policymakers (Avkiran, 2018). Among the different SEM methods, partial least square (PLS) was applied in this study. PLS is an SEM technique that is well suited for assessing complex predictive models. SEM is a common data analysis method used in business research (Guenther et al., 2023). The two most common methods for determining SEM are covariance-based SEM (CB-

SEM) and partial least squares SEM (PLS-SEM). Whereas PLS-SEM focuses on explaining the variance in the model's dependent variables, CB-SEM is mainly used to confirm or reject theories and their underlying hypotheses (Vinkóczi et al., 2024). PLS-SEM confirms/rejects hypotheses by determining how closely a proposed theoretical model can reproduce the covariance matrix for an observed sample dataset (Vaithilingam et al., 2024).

PLS was adopted to analyze the data using SMART-PLS software. Patient satisfaction determinants were evaluated by estimating multivariate models via PLS analysis. Path models are diagrams that visually display the hypotheses and variable relationships examined when SEM is applied. Model fit indices should be assessed before interpreting the PLS modeling results (West et al., 2023). The statistical analysis accordingly explored and presented the following points:

- Descriptive statistics for the patients' characteristics
- Regression models to test hypotheses and explore the association between patient satisfaction and satisfaction dimensions.
- Overall patient satisfaction as a dependent outcome measure.

Results

Descriptive statistics were used to describe the demographic characteristics of the study sample. Table 7.1 Summarizes the patients' clinical and demographic characteristics in the satisfaction questionnaire surveys. There was no predominance of male (45%) or female (55%) participants, indicating that the sample was not biased toward a particular gender. In this sample, 71% of participants were younger than 50 years old. Twenty-four patients visited the hospital more than once, while most of the patients visited the hospital at least once. The typical referral types include GPs (39%), self-referral (46%), ambulances (9%),

and clinics (2%). Between noon and 6 pm, 36% of patients visited the ED. The percentage of participants admitted to the hospital at the end of their visit was 66.3%, whereas 32.5% of participants were discharged home.

The questions employ a five-point Likert scale ranging from very poor to excellent. The option of not applicable was added, as not all patients went through all the treatment stages, including diagnostic investigations and medication prescriptions. At the end of the questionnaire, the patients were asked to rate their overall satisfaction level.

Table 1. Clinical and demographic information for patients who completed the satisfaction survey.

Characteristic	Frequency	(%) of patients
Number	148	
Gender		
Female	81	55%
Male	67	45%
Age Group		
<18	03	02%
18-24	33	22%
25-34	34	34%
35-50	39	26%
51-65	21	14%
>65	18	12%
Educational Level		
Primary	13	09%
Secondary	64	43%
Third Level	55	37%
Referral Type		
Ambulance	13	09%
Clinic	03	02%
G.P.	57	39%
Self-Referral	68	46%
Other	07	05%
Time of Arrival		
Midnight – 8 a.m.	09	06%
8 a.m. – Noon	32	22%
Noon – 6 p.m.	54	36%
6 p.m. - Midnight	53	36%

A total of 36.3% of the participants rated their satisfaction as fair or less, including poor and very poor, whereas 35% and 28.7% rated their satisfaction as very good and excellent, respectively (Figure 1).

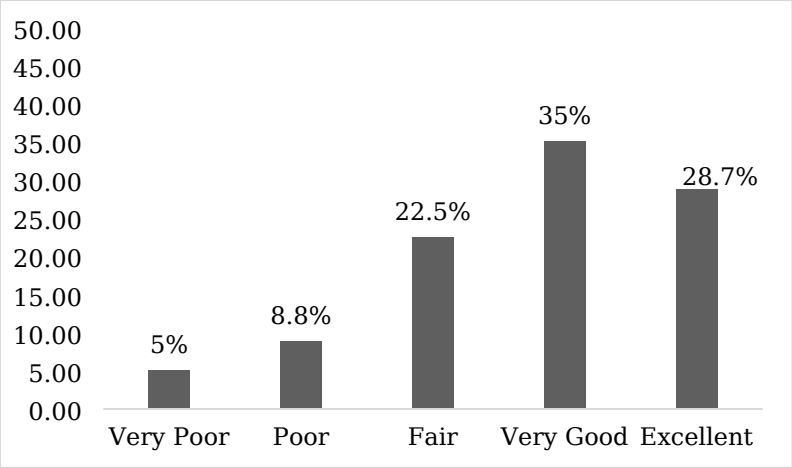

Figure 1. Overall satisfaction ratings.

In the next stage, the reliability and validity of the proposed patient satisfaction model must be verified by examining its explanatory and predictive power. The conceptual PLS model presented in Figure 2 was used. PLS-SEM involves a two-step approach, including estimating and solving the blocks of the measurement model and later analyzing and estimating the path coefficients in the structural model (Schuberth et al., 2023). SMART-PLS software was used to estimate the PLS model.

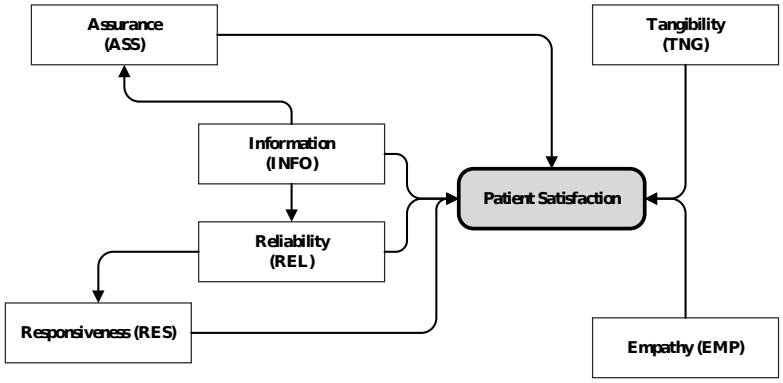

Figure 2. Conceptual PLS model to represent patient satisfaction.

Measurement model

The measurement model (known as the outer model) represents the relationships among the constructs and the indicator variables. As per the PLS conceptual model (Figure 2), six models are measured: tangibility, information, assurance, empathy, responsiveness, and reliability. Tangibility was measured by 5 indicators, information and reliability were measured by six indicators, and empathy and assurance were measured by 5 indicators. Content validity: Individual item reliability, internal consistency and convergent validity are confirmed using a measurement model (Cheung et al., 2024). Reliability and validity are the two major methods for assessing the quality of a measurement model (Sureshchandar et al., 2023). Reliability is the degree to which data collection (tools and techniques) produces consistent results when the measured unit has not changed (Nawi et al., 2020). Furthermore, convergent validity refers to the extent to which a test measures the same thing as other tests purported to measure that construct (Lim, 2024). Content validity was tested to confirm the language clarity, practical relevance, and theoretical relevance of the findings (Marie et al., 2021). Correspondingly, the same panel of experts who were asked for their opinion about the patient's expectations were asked once more to review the patient's questionnaires.

Furthermore, experienced healthcare and academic teams were asked to assess face-to-face content validity to determine the appropriateness and relevance of the questions to the research questions. The questionnaires were revised based on the panel's feedback until they were judged to be ready. A pilot study was conducted

over one week to ensure that the questions were comprehensible, clear and easily understood by the participants. Patient satisfaction questionnaires were distributed to 13 patients, for a response rate of 84%. Participants were asked to provide feedback to identify difficult questions. There were no critical comments about any of the questions received from the respondents. Consequently, no changes were made to the questions. Additionally, cognitive interviewing was conducted with respondents to determine how they understood the questions and how they selected their responses.

The internal consistency reliability was assessed using Cronbach's alpha (CA) and composite reliability (CR) values, which offer powerful evidence of the reliability of the measurements (Kalkbrenner et al., 2023).

Cronbach's alpha was developed as a measure of the internal consistency of a set of scale or test items and is mostly used when multiple-item measures of concept are used. According to (Hanafiah, 2020), CA and CR must be ≥ 0.7. Table 2 contains the convergent validity and reliability of the indicator variables. Composite reliability and the average variance extracted (AVE) are usually employed to assess convergent validity (Hair et al., 2011). The strength of the relationship linking patient satisfaction to the dimensions indicates the convergent validity of the construct. The average variance extracted (AVE) should be at least 0.50. As presented in Table (2), CA and CR are both ≥0.7, and the AVE is greater than 0.50. The results indicate that the model has satisfactory reliability and validity.

Multicollinearity must be tested next. Multicollinearity must be examined to confirm that there is no high correlation among two or more independent variables. Accordingly, exogenous latent constructs in PLS procedures are not supposed to be highly correlated (Hair and Sarstedt, 2019). Multicollinearity affects the statistical

significance of the construct. Additionally, the variance inflation factor was measured. The VIF was used in many studies because it is considered the reciprocal of the tolerance value. Accordingly, small VIF values indicate a low correlation among variables and vice versa (Thoma et al., 2018). A VIF greater than 5 thus represents high multicollinearity (Wondola et al., 2020). As demonstrated in Table 3, there is no high correlation between the latent constructs and VIFs less than 5. Hence, there is no multicollinearity problem among the latent variables.

Table 2. Convergent validity and reliability.

Constructs	Variables	CR	AVE	AVF
Tangibility (TNG)	T1	0.801	0.652	1.42
	T2			
	T3			
	T4			
	T5			
Information (INFO)	I1	0.864	0.729	2.95
	I2			
	I3			
	I4			
	I5			
	I6			
Assurance (ASS)	A1	0.812	0.687	2.52
	A2			
	A3			
Empathy (EMP)	E1	0.855	0.714	1.98
	E2			
	E3			
Responsiveness (RES)	Res1	0.838	0.663	1.87
	Res2			
	Rel1			
	Rel2			
	Rel3			

Reliability (REL)	Rel4	0.883	0.743	2.21
	Rel5			
	Rel6			
Satisfaction		0.820	0.702	

The significance and relevance of the indicators can be assessed through their outer weight using a bootstrapping procedure (Cheah et al., 2021). The bootstrapping procedure tests whether the outer weights are significantly different from zero. To assess significance, one can start bootstrapping with 10,000 subsamples to check whether the outer weights are significantly different from zero, as recommended by Hair and Sarstedt (2019).

Table 3. Coefficient correlation matrix and VIF.

Dimensions	**TNG**	**INFO**	**ASS**	**EMP**	**RES**	**REL**	**Satisfaction**	**VIF**
Tangibility	1.000	0.00	0.00	0.00	0.00	0.00	0.00	2.52
Information	0.422	1.000	0.00	0.00	0.00	0.00	0.00	2.35
Assurance	0.478	0.312	1.000	0.00	0.00	0.00	0.00	1.98
Empathy	0.325	0.462	0.299	1.000	0.00	0.00	0.00	2.67
Responsiveness	0.356	0.354	0.258	0.334	1.000	0.00	0.00	2.25
Reliability	0.481	0.282	0.385	0.291	0.387	1.000	0.00	2.34
Satisfaction	0.42	0.39	0.33	0.49	0.50	0.37	1.000	2.64

Additionally, guidelines were provided by Legate et al. (2021) to manage nonsignificant indicator weights. The researcher should consider either the absolute contribution [provided by measuring the weight in PLS-SEM] or the absolute importance of the indicator to the construct. Accordingly, if the indicator outer

weight is not significant (p> .05) but at the same time its outer loading is >0.50, the researcher should decide whether to retain it or remove it based on its absolute importance. On the other hand, if the indicator's outer weight is not significant (p>.05), its outer loading is <0.5, and there is no evidence for its conceptual relevance, the indicator should be removed from the measurement model. Table (4) shows that all the indicators are statistically significant, excluding 6. The nonsignificant indicators were retained because of their theoretical relevance, and their outer loading was >0.5, as recommended by (Hair et al., 2011).

Structural Model

The structural model, known as the inner model, displays the relationships among the latent variables in the proposed model. After confirming that the outer model's variables are reliable and valid, the next stage is to assess the structural model (inner model). According to (Hair et al., 2014), five stages should be followed as the criteria for evaluating the structural model assessment procedure:

1) Assess whether the structural model has collinearity. As per Table 3, for the coefficient correlation matrix and VIF, there is no collinearity issue.
2) Assessing the significance of the path coefficient
3) Evaluate the coefficient of determination (R)
4) Evaluate the effect size (f)
5) Evaluate the predictive relevance (Q).

Assess the significance of the path coefficient

The next step in the structural model analysis is evaluating the significance level of the hypothesized relationships (i.e., path coefficients) among the constructs. Path coefficients represent the main outcomes of PLS-SEM, quantifying the hypothesized relationships of structural models (Kukah et al., 2024). In PLS, the tool for

investigating the significance of path coefficients is the bootstrapping technique, which has a standardized value from − 1 to + 1 and is interpreted the same as standardized regression coefficients (Vishnoi et al., 2024). The method tries to estimate the sampling distribution of a statistic by resampling with replacement from the original sample.

Table 4. Results of the Construction of Outer Weights for Significance Testing.

	Variable	**Outer weight**	**Outer loading**	**T value**	**P value**	**Sig. (P<0.05)**
Tangibility (TNG)	T1	0.310	0.788	3.15	0.00	Yes
	T2	0.271	0.665	2.85	0.006	Yes
	T3	0.182	0.716	1.92	0.061	No
	T4	0.143	0.753	1.431	0.171	No
	T5	0.217	0.875	2.23	0.022	Yes
Information (INFO)	I1	0.263	0.723	2.71	0.007	Yes
	I2	0.225	0.846	2.28	0.044	Yes
	I3	0.103	0.698	1.2	0.209	No
	I4	0.259	0.733	2.621	0.008	Yes
	I5	0.152	0.765	2.163	0.128	No
	I6	0.218	0.872	2.25	0.021	Yes
Assurance (ASS)	A1	0.286	0.665	3.1	0.012	Yes
	A2	0.297	0.856	3.05	0.002	Yes
	A3	0.250	0.761	2.588	0.016	Yes
Empathy (EMP)	E1	0.090	0.752	0.19	0.243	No
	E2	0.223	0.851	2.245	0.027	Yes
	E3	0.257	0.739	2.581	0.016	Yes
Responsiveness (RES)	Res1	0.250	0.761	2.613	0.009	Yes
	Res2	0.217	0.875	2.24	0.024	Yes
	Rel1	0.127	0.825	1.26	0.205	No
	Rel2	0.132	0.728	1.35	0.201	No
	Rel3	0.275	0.691	2.81	0.007	Yes
	Rel4	0.215	0.883	2.252	0.019	Yes

Reliability (REL)	Rel5	0.264	0.721	3.12	0.001	Yes
	Rel6	0.222	0.854	2.81	0.006	Yes

Bootstrapping procedures using 5000 subsamples were applied as recommended by (Hair et al., 2014) to measure the significance of the path coefficients through t values and p values. As per the proposed construct within the patient satisfaction framework, there are 6 proposed relationships: tangibility H1, assurance H2, reliability H3, empathy H4, information H5 and responsiveness H6. Figure 3 presents the hypotheses' direction and the constructs' relationship. Six hypotheses are proposed in line with the literature review for the factors affecting patient satisfaction. A hypothesis is a tentative statement about the relationship between two or more variables (Lawal et al., 2024).

Hypothesis 1 (H1): Tangibility positively influences patient satisfaction.
Hypothesis 2 (H2): Assurance positively influences patient satisfaction.

Hypothesis 3 (H3): Reliability positively influences patient satisfaction.

Hypothesis 4 (H4): Empathy positively influences patient satisfaction.

Hypothesis 5 (H5): Information positively influences patient satisfaction.
Hypothesis 6 (H6): Responsiveness positively influences patient satisfaction.

Hypothesis 7 (H7): Reliability mediates the relationship between information and patient satisfaction.

Hypothesis 8 (H8): Assurance mediates the relationship between information and patient satisfaction.

Hypothesis 9 (H9): Responsiveness mediates the relationship between reliability and patient satisfaction.

Hypotheses Results

The hypotheses are presented in Table (5).

Hypothesis 1 (H1): Tangibility positively influences patient satisfaction.

Surprisingly, the direct and positive relationship between tangibility and patient satisfaction was not supported. The relationship structural path had a low coefficient (B=0.184, P>0.05) and was not statistically significant. Accordingly, this hypothesis was rejected.

Hypothesis 2 (H2): Assurance positively influences patient satisfaction.

The direct and positive relationship between assurance and patient satisfaction was supported. The path coefficient revealed that assurance was strongly associated with patient satisfaction (β =0.252, P<0.05).

Hypothesis 3 (H3): Reliability positively influences patient satisfaction.

The path coefficients revealed that reliability was strongly associated with negative patient satisfaction (β =- 0.425, P<0.05).

Hypothesis 4 (H4): Empathy positively influences patient satisfaction.

Surprisingly, the direct and positive relationship between assurance and patient satisfaction was not supported (β =0.179, P>0.05). Accordingly, this hypothesis was rejected.

Hypothesis 5 (H5): Information positively influences patient satisfaction.

The direct and positive relationship between assurance and patient satisfaction was supported. The path coefficient revealed that assurance was strongly associated with patient satisfaction (β =0.531, P<0.05).

Hypothesis 6 (H6): Responsiveness positively influences patient satisfaction.

The direct and positive relationship between assurance and patient satisfaction was supported. The path coefficient revealed that assurance was strongly associated with patient satisfaction (β =0.306, P<0.05).

Further analysis of the model was conducted, and the mediating relationships were examined (Hypotheses 7, 8 and 9). The indirect path between information and

reliability as a mediator was significant (β = 0.283, p<0.05). Similarly, a significant value also supports the indirect relationship between information and assurance (β = 0.258, p<0.05). This indicates that the information influenced patient satisfaction directly and indirectly through assurance and reliability.

The indirect relationship between reliability and responsiveness was not significant (β=0.167, P>0.05). These indirect effects significantly help us understand the relationships between the dimensions and their impact on patient satisfaction.

Table 5. Hypothesis test results.

Path	***Relationship type***	***Coefficient***	***T-statistics***	***P- Values***	***Result***
Tangibility → Patient satisfaction	*Direct effect*	*0.184*	*1.74*	*0.057*	**Not Supported**
Assurance → Patient satisfaction	*Direct effect*	*0.252*	*3.87*	*0.008*	Supported
Reliability → Patient satisfaction	*Direct effect*	*-0.425*	*8.28*	*0.00*	Supported
Empathy → Patient satisfaction	*Direct effect*	*0.179*	*0.915*	*0.061*	**Not Supported**
Information → Patient satisfaction	*Direct effect*	*0.531*	*10.61*	*0.00*	Supported
Responsiveness → Patient satisfaction	*Direct effect*	*0.306*	*4.52*	*0.001*	Supported

Information → Reliability → Patient satisfaction	*Indirect effect*	*0.283*	*4.1*	*0.03*	Supported
Information → Assurance → Patient satisfaction	*Indirect effect*	*0.258*	*4.02*	*0.006*	Supported
Reliability → Responsiveness → Patient satisfaction	*Indirect effect*	*0.167*	*1.41*	*0.080*	**Not Supported**

Evaluate the coefficient of determination (R^2 value)

The coefficient of determination (R^2) demonstrates the extent of variability accounted for by the exogenous variable in its endogenous counterpart and measures the model's predictive power. The R^2 values range from 0 to 1, with higher values indicating greater predictive accuracy and model fit. Chin (1998) considered coefficient values of 0.67, 0.33, and 0.19 in PLS-SEM to be significant, moderate, and weak, respectively.

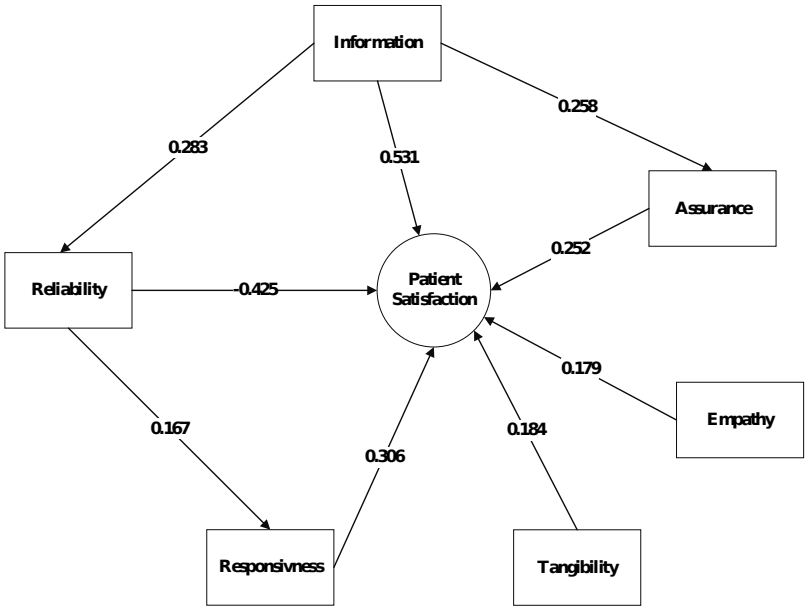

Figure 3. Structural Path Model Testing.

Similarly, Sarstedt (2014) recommended R^2 values of 0.75, 0.50, and 0.25 and labeled them substantial, moderate, or weak, respectively. In this study, the R^2 value was 0.792 (Table 6). According to the above recommendation, the model can be considered significant or substantial since it exceeded 0.67 and 0.75%, respectively. Accordingly, the dimensions accounted for 79.2% of the variability in patient satisfaction.

Table 6. R^2 and adjusted R^2 values

Latent Construct	R-Square	R-Square adjusted
Patient Satisfaction	0.792	0.785

Evaluate the Effect Size (f^2)

The next step was to measure the effect size (f^2). Measuring f^2 represents the changes in the R^2 value for the endogenous construct if the exogenous construct is omitted in the model. The effect size values are 0.02, 0.15, and 0.35, representing

small, medium, and large effects, respectively. A value of f^2 below 0.02 is an indication of no effect. As presented in Table (7), the effect sizes for tangibility and empathy were small, medium for information and assurance, and large for reliability.

Table 7. Effect of f^2 Sizes.

Latent Construct	F-Square	Effect Size
Tangibility	0.045	Small
Information	0.25	Medium
Assurance	0.18	Medium
Empathy	0.068	Small
Responsiveness	0.22	Medium
Reliability	0.36	Large

Evaluate the Predictive Relevance Q^2

The next step in the analysis is to measure the Predictive Relevance [Q^2] using Stone–Geisser's Q2 value (Stone, 1974; Geisser, 1974). The Stone–Geisser criterion recommends that the model be able to predict the endogenous latent variable indicators (Vishnoi et al., 2024). If the Q^2 values are greater than zero, the path model has good predictive relevance. In PLS-SEM, the blindfolding procedure is used. The measured Q^2 is 0.328 (greater than zero), as presented in Table 8, and can be regarded as a medium. This result suggested a good fit for the model prediction.

Table 8. Q2 Predictive relevance.

Latent Construct	SSO	SSE	$Q^2 = 1-SSE/SSO$
Tangibility	1350	1350	
Information	2039	2039	
Assurance	1890	1890	
Empathy	2320	2320	
Responsiveness	1560	1560	
Reliability	1733	1733	
Patient Satisfaction	1450	975	**0.328**

Discussion

A comparison of the path coefficients revealed that ED decision-makers should focus their attention on the information provided to patients (β=0.531), which is strongly associated with positive patient satisfaction and a medium-sized effect (f^2=0.25), as per our results. Accordingly, adequate information about waiting time, diagnosis, medication, side effects and discharge instructions must be understandable. These results are supported by the literature, which states that communicating with patients and their families is the strongest predictor of patient satisfaction. Moreover, reliability (β =-0.425) is strongly associated with negative patient satisfaction and requires priority from ED decision-makers, as it also had the highest effect size (f^2=0.36). Reliability focuses mainly on the patient's acceptable time to see the doctor, diagnostics, procedures, and transfer to the ward if the patient is admitted. The literature supports these results, as it is considered a strong predictor of patient satisfaction. Waiting times have been widely publicized, negatively affecting patient safety and increasing morbidity (Seo et al., 2024). According to the literature, satisfaction related to reliability, especially long waiting hours, is affected by the information provided (Ye and Wu, 2024). The study supported the literature by examining the mediating effect of reliability on information and patient satisfaction (Hypothesis 7).

Unsurprisingly, and like the findings of the literature (Mohammadi-Sardo and Salehi, 2019), the construct of responsiveness (β=0.306) is associated positively with patient satisfaction, as it is related to direct contact with patients and their families, answering their questions and addressing patients’ pain immediately. The willingness to help and answer patients' and their families’ questions is a gap in the

literature (Singh and Sharma, 2016) and an area that requires enhancement in healthcare. Many factors contribute to the deficit in this area, including the workload in the ED, which affects healthcare teams' efforts to build therapeutic relationships with patients and their families (Kwame and Petrucka, 2021). Surprisingly, the mediating effect of responsiveness on reliability and patient satisfaction was not supported.

ED managers should consider the construct of assurance (β =0.252) a further priority because it positively enhances patient satisfaction. Assurance is related to the healthcare team's knowledge, skills, and courtesy. The healthcare team plays a crucial role in the patient's feeling of assurance by obtaining the required knowledge and skills to treat the patient. Patients should believe that the healthcare team is medically competent.

Surprisingly, although some studies (Kalaja, 2023) have reported tangibles as an influential predictor of patient satisfaction, tangibles are not positively associated with patient satisfaction (β =0.184). In contrast to the findings of other studies (Handoko and Handayani, 2023), empathy (β =0.179) was not positively associated with patient satisfaction. However, additional investigations in this area are needed to determine the main reasons involved. One potential reason is that patients focus on receiving the right treatment with less emphasis on the waiting room, food or healthcare.

Conclusion

Understanding the determinants of patient satisfaction allows policymakers and healthcare decision-makers to improve services in the emergency department. Using the structural equation modeling approach, a patient satisfaction model was

developed. According to our results, information, responsiveness, and assurance were proven to be positively associated with patient satisfaction in our model. In contrast, patient satisfaction was negatively influenced by reliability. Furthermore, only 63.7% of the participants reported their satisfaction as very good or excellent. Accordingly, more attention should be given to patient satisfaction, focusing on the determinant of patient satisfaction recognized in this study.

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