

Analysis of Healthcare Services Quality Using Servqual - Fuzzy Method

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Abstract

Service Quality is a very important concept that must be understood if the company wants to remain competitive and evolving. Quality of service in hospitals should be directed to patient satisfaction, this is to maintain patient loyalty. With the development of business competition, it is important to make health care providers improving their service qualities. The purpose of this research was to identify the gap between perception and expectation of customer to health service at inpatient unit of Dr. Ramelan hospital. In this research, we used servqual method which was integrated with fuzzy method. Based on the results of this study, it was showed that the attributes of X_5 (bathroom hygiene and clean water availability) had the greatest gap of 25 health service attributes identified at the Dr. Ramelan hospital. Based on the results of this study, it could be concluded that the results could assist the management of the hospital in determining the policy strategy by prioritizing attributes that have a big gap to improve the quality of its services.

Keywords: Service quality; Fuzzy; Health care

Introduction

One of the important concepts in management and business is service quality. Service quality is a very important concepts that companies must understand if they want to remain competitive and evolving. Service quality becomes increasingly important for today's business, particularly in high-customer involvement industries such as healthcare services [1]. Health care service providers should disseminate correct information from time to time as more quality information leads to patient awareness and satisfaction [2]. Service quality in hospitals should be directed towards the satisfaction of patients [3]. Service quality and customer satisfaction have been recognized as the main preserve of customer loyalty [4].

With the development of business competition, it is important to make health care providers improving their service qualities. This research is to analyze how the quality of health service in inpatient unit of Dr. Ramelan Surabaya hospital. Based on the results of this study, it could be conclude that it can assist the management of the hospital in determining the policy strategy by prioritizing attributes that have a big gap to improve the quality of its services.

The purpose of this paper was to identify the gaps between customer expectations of a service and their perceptions of service at Dr. Ramelan hospital, particularly in inpatient units. This paper used a Servqual approach that was integrated with the fuzzy method to gain a gap between the perceptions and expectations of consumers. This approach had been used extensively to assess the quality of private sector services, but there was little application to public services [5].

This paper had many literature to support the research, for example paper titled "A Conceptual Model of Service Quality and Its Implications for Future Research" [6] and other research such as SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality [7]. Five Imperatives for Improving Service Quality [8]. Health Care Service Quality: Case Example of a Hospital with Lean Implementation. A study on Service quality and customer satisfaction of selected Private hospitals of Vadodara City. Service Quality and Determinants Of Customer Satisfaction In Hospitals: Turkish Experience [9]. A Comparative Study of Service Quality on Patient Satisfaction Between Public Hospital in Johor Bahru. Impact of Service Quality on Customers' Satisfaction [10]. Essentials for improving

service quality in cancer care [11]. A Review on Dimensions of Service Quality Models [12]. Service Quality in the Public Service.

The other literature supporting this paper was Measuring Consumer Satisfaction in Healthcare Sektore: The Applicability of Servqual [13]. The Dimensions of Service Quality for Hospital [14]. Factors influencing healthcare service quality [15]. Hospital Service Quality and its Effect on Patient Satisfaction and Behavioural Intention [16]. The Assessment of Perceived Service Quality of Public Health Care Services in Romania Using the SERVQUAL Scale [17]. SERVQUAL: Measuring higher education service quality in Thailand [18]. Service quality assessment in health care sector: the case of Durres public hospital [19]. Assessing Obstetrics Perceived Service Quality at a Public Hospital [20,21].

The results of this study can be used by the management of the hospital as a material consideration in determining the policy strategy to improve the quality of service.

Materials and Methodology

Service quality

The first is that customers are the sole judge of service quality. Customers assess service by comparing the service they receive (perceptions) with the service they desire (expectations). Majority of research pertaining to service quality has focused on the measurement of service quality based on the functional dimension [22]. The techniques of measuring service quality and service quality dimensions have become a major area in marketing literature during the past few decades.

Service quality is identified into ten dimensions, which the customer

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uses to evaluate the service quality. They are reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding/knowing the customer, and tangibles. Thus, servqual is developed from a modification of ten dimensions to five principal dimensions customers, which are tangibles, reliability, responsiveness, assurance and empathy. The instrument in servqual is summarized in five dimensions called service quality model (The Gaps Models). Service Quality Model is a model that can analyze the gap between two main variables, the services expected by the customers (expectation) and services they receive (perception) (Figure 1).

Fuzzy

Generally, the fuzzy set is an extension of the crisp set, the set that divides a group of individuals into two categories, namely members and non-members. Fuzzy number is a special fuzzy set $F = \{(x, \mu_F(x)), x \in R\}$ where x where x is the values that lie on the line of real numbers. R^1 ; $-\infty < x < +\infty$ $R:1$ and μ_F is a continuous mapping of R^1 into the closed interval $[0, 1]$. Fuzzy number is used to describe non-precise numerical concepts. A triangular fuzzy number (TFN), expressed by $M = (a, b, c)$, where $a < b < c$, is a special fuzzy number and has the following type triangular membership function [23]:

$$\mu_M(x) = \begin{cases} 0, & \text{if } x \leq a \\ (x-a)/(u-a) & \text{if } a < x \leq u \\ (x-b)/(u-b) & \text{if } u < x \leq b \\ 0, & \text{if } x \leq b \end{cases}$$

Methodology of Research

The methodology of this research is described as follows:

The stages of this research were data collection, validity and reliability test, fuzzyfication, calculation of mean value, defuzzyfication, calculation of servqual value without weight, calculation of weight of each variable, calculation of weighted servqual value. The stage of data collection in this study was performed to identify the attributes of health services, preparation of questionnaire, and then distributed the questionnaire to the respondents (Figure 2). Respondents used in this research were patient or family of patient in Dr. Ramelan hospital, especially in inpatient units. In this research, a total amount of 25 attributes of health services had been identified to be assessed by the respondents, such attributes were shown in Table 1.

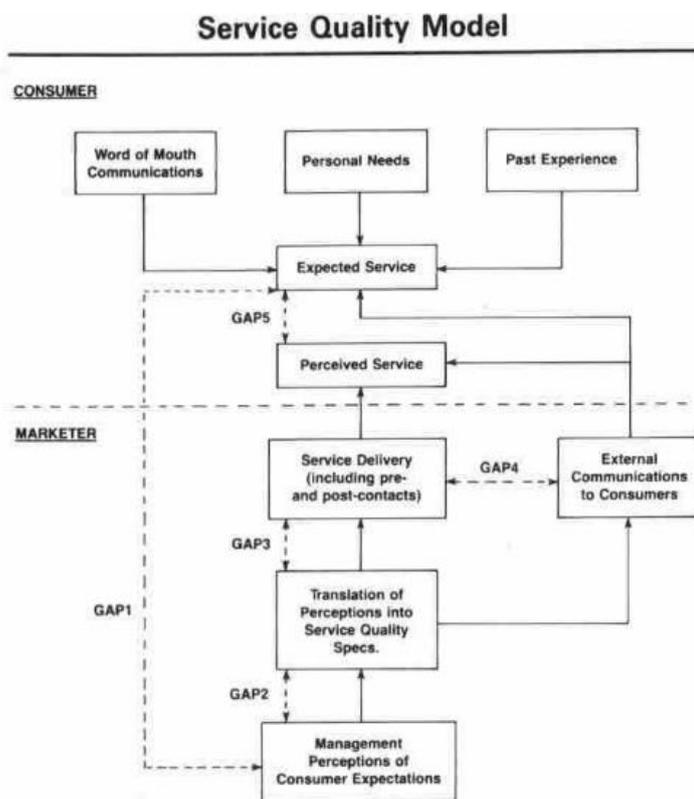
Result and Discussion

Result

In this study, Likert scale was used as measuring tools in the questionnaire. Questionnaires were distributed to 98 respondents randomly at the inpatient unit of the Dr. Ramelan hospital. The test validity and reliability from the results of the questionnaire were performed with SPSS 17.0 software.

Fuzzification of respondent's data (perception and expectation) was done by changing the result of respondent appraisal (in likert scale) to form fuzzy number with formation TFN_s (Triangular Fuzzy Number) (Table 2).

After all the fuzzification results obtained in each attribute, then the average (perceptions and expectations of respondents) from each attribute was calculated, and the defuzzification stage was subsequently performed (Tables 3 and 4).



Source: Parasuraman et al. [6].

Figure 1: Service quality model.

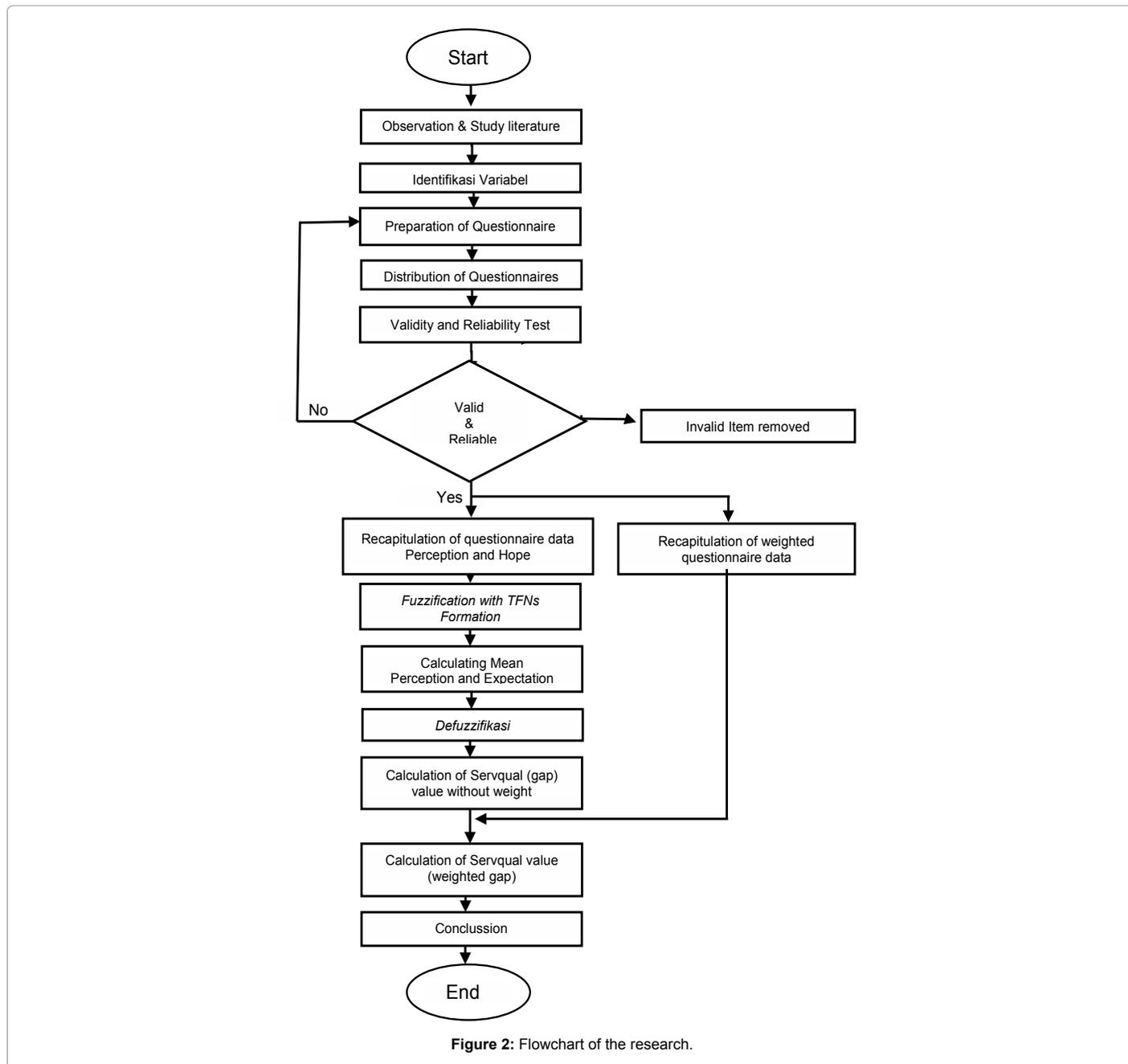


Figure 2: Flowchart of the research.

The next stage was the calculation of servqual value (gap) without weight (Table 5). Servqual Value (gap score)=Mean of perception - Mean of expectation.

The next step after the obtained of servqual value without weight performed was the weighting of each attribute. In this study, the weighing of the attribute was performed by calculating the value average of each service quality attribute given by the respondent. Weighted questionnaires were distributed to experts in the health sector, in this case the staff of Dr. Ramelan hospital as many as 10 respondents. Based on the distributed questionnaire data, the results of weighting each attribute were obtained as shown in Table 6.

After the result of weighting each attribute were obtained, servqual

weighted value was subsequently counted by multiplying servqual value without weight with weight value of each attribute (Table 7).

Discussion

The respondent's perception value indicated the level of service quality received by the patient during the use of health services at Dr. Ramelan hospital. Based on the average value of respondent perception, attribute X_5 (Cleanliness of the bathroom and availability of clean water) had the lowest value, while the attribute X_8 (Neatness and cleanliness of the appearance of doctors and nurses) had the highest value. The expectation value of the respondent showed the respondent's willingness to the quality of service that should be given by Dr. Ramelan hospital. The highest expectation value was the attribute of doctors'

Tangibles	(X ₁)	Convenient to Inpatient unit location
	(X ₂)	Cleanliness, tidiness and comfort of the bedroom
	(X ₃)	lighting and bedroom ventilation
	(X ₄)	completeness of bedroom facilities
	(X ₅)	Cleanliness of the bathroom and availability of clean water
	(X ₆)	The availability of medication required by the patient
	(X ₇)	Completeness, readiness and cleanliness of medical devices used
	(X ₈)	Neatness and cleanliness of the appearance of doctors and nurses
	(X ₉)	Taste and variety of food menu served
Reliability	(X ₁₀)	Fast, accurate examination, treatment and treatment services
	(X ₁₁)	The patient's examination schedule is performed appropriately
	(X ₁₂)	The service procedure is not complicated
	(X ₁₃)	easy to contact the hospital staff
Responsiveness	(X ₁₄)	The nurse's alertness when the patient needs help
	(X ₁₅)	The ability of doctors and nurses to resolve patient complaints
	(X ₁₆)	Doctors and nurses provide a clear and understandable information
Assurance	(X ₁₇)	Attention to patients who need service
	(X ₁₈)	The availability of doctors and nurses at the time of patient need
	(X ₁₉)	The ability of doctors to analyze the disease
	(X ₂₀)	The accuracy of the medical team handles the patient
Empathy	(X ₂₁)	Patience of nurses in caring for patients
	(X ₂₂)	Courtesy and hospitality of nurses and doctors
	(X ₂₃)	patient easy complaint submission
	(X ₂₄)	The ability of doctors and nurses to provide moral support to patients
	(X ₂₅)	Service to all patients regardless of social status

Table 1: Attribute of health services.

Respondents	Atribut X1			
	Nilai	Fuzzy		
		Low	Crisp	Upp
1	3	2	3	4
2	3	2	3	4
3	3	2	3	4
4	3	2	3	4
5	5	4	5	6
6	4	3	4	5
7	5	4	5	6
8	3	2	3	4
9	3	2	3	4
10	3	2	3	4
11	3	2	3	4
12	4	3	4	5
13	3	2	3	4
14	3	2	3	4
15	3	2	3	4
16	4	3	4	5
17	3	2	3	4
18	5	4	5	6
19	5	4	5	6
20	3	2	3	4
21	5	4	5	6
22	3	2	3	4
23	5	4	5	6
24	4	3	4	5
25	3	2	3	4
26	4	3	4	5
27	4	3	4	5
28	2	1	2	3
29	5	4	5	6
30	3	2	3	4
31	4	3	4	5
32	3	2	3	4
33	3	2	3	4
34	4	3	4	5
35	4	3	4	5
36	3	2	3	4
37	3	2	3	4
38	4	3	4	5
39	3	2	3	4
40	4	3	4	5
41	3	2	3	4
42	2	1	2	3
43	3	2	3	4
44	3	2	3	4
45	5	4	5	6
46	4	3	4	5
47	4	3	4	5
48	3	2	3	4
49	4	3	4	5
50	4	3	4	5
51	3	2	3	4
52	3	2	3	4
53	2	1	2	3
54	3	2	3	4
55	4	3	4	5
56	4	3	4	5
57	5	4	5	6
58	3	2	3	4
59	4	3	4	5
60	4	3	4	5
61	3	2	3	4
62	3	2	3	4
63	3	2	3	4
64	4	3	4	5
65	4	3	4	5

66	3	2	3	4
67	2	1	2	3
68	4	3	4	5
69	4	3	4	5
70	4	3	4	5
71	4	3	4	5
72	5	4	5	6
73	5	4	5	6
74	4	3	4	5
75	4	3	4	5
76	5	4	5	6
77	4	3	4	5
78	3	2	3	4
79	3	2	3	4
80	4	3	4	5
81	5	4	5	6
82	3	2	3	4
83	3	2	3	4
84	3	2	3	4
85	4	3	4	5
86	3	2	3	4
87	3	2	3	4
88	3	2	3	4
89	3	2	3	4
90	4	3	4	5
91	4	3	4	5
92	4	3	4	5
93	3	2	3	4
94	4	3	4	5
95	4	3	4	5
96	4	3	4	5
97	3	2	3	4
98	3	2	3	4

Table 2: Fuzzyfication perceptions for attributes X_1 .

Attribute	Fuzzy			Defuzzyfication
	Low	Crisp	Upp	
X_1	2.59	3.59	4.59	3.5
X_2	2.58	3.58	4.58	3.49
X_3	2.82	3.82	4.82	3.73
X_4	2.6	3.6	4.6	3.51
X_5	2.31	3.31	4.31	3.2
X_6	2.7	3.7	4.7	3.61
X_7	2.65	3.65	4.65	3.56
X_8	2.97	3.97	4.97	3.88
X_9	2.39	3.39	4.39	3.29
X_{10}	2.64	3.64	4.64	3.55
X_{11}	2.68	3.68	4.68	3.59
X_{12}	2.62	3.62	4.62	3.53
X_{13}	2.59	3.59	4.59	3.5
X_{14}	2.87	3.87	4.87	3.78
X_{15}	2.85	3.85	4.85	3.76
X_{16}	2.79	3.79	4.79	3.7
X_{17}	2.86	3.86	4.86	3.77
X_{18}	2.73	3.73	4.73	3.64
X_{19}	2.68	3.68	4.68	3.59
X_{20}	2.88	3.88	4.88	3.79
X_{21}	2.7	3.7	4.7	3.61
X_{22}	2.94	3.94	4.94	3.85
X_{23}	2.72	3.72	4.72	3.63
X_{24}	2.68	3.68	4.68	3.59
X_{25}	2.72	3.72	4.72	3.63

Table 3: Mean Perceptions of Respondents (Fuzzy) and Defuzzyfication.

Attribute	Fuzzy			Defuzzyfication
	Low	Crisp	Upp	
X_1	3.16	4.16	5.16	4.08
X_2	3.34	4.34	5.34	4.26
X_3	3.29	4.29	5.29	4.21
X_4	3.17	4.17	5.17	4.09
X_5	3.4	4.4	5.4	4.32
X_6	3.47	4.47	5.47	4.39
X_7	3.41	4.41	5.41	4.33
X_8	3.23	4.23	5.23	4.15
X_9	3.27	4.27	5.27	4.19
X_{10}	3.45	4.45	5.45	4.37
X_{11}	3.36	4.36	5.36	4.28
X_{12}	3.32	4.32	5.32	4.24
X_{13}	3.35	4.35	5.35	4.27
X_{14}	3.54	4.54	5.54	4.47
X_{15}	3.45	4.45	5.45	4.37
X_{16}	3.44	4.44	5.44	4.36
X_{17}	3.48	4.48	5.48	4.4
X_{18}	3.44	4.44	5.44	4.36
X_{19}	3.54	4.54	5.54	4.47
X_{20}	3.58	4.58	5.58	4.51
X_{21}	3.48	4.48	5.48	4.4
X_{22}	3.44	4.44	5.44	4.36
X_{23}	3.31	4.31	5.31	4.23
X_{24}	3.34	4.34	5.34	4.26
X_{25}	3.47	4.47	5.47	4.39

Table 4: Mean Expectation of Respondents (Fuzzy) and Defuzzyfication.

Attribute	Perception	Expectation	Gap score
X_1	3.5	4.08	-0.59
X_2	3.49	4.26	-0.77
X_3	3.73	4.21	-0.48
X_4	3.51	4.09	-0.59
X_5	3.2	4.32	-1.12
X_6	3.61	4.39	-0.78
X_7	3.56	4.33	-0.77
X_8	3.88	4.15	-0.27
X_9	3.29	4.19	-0.9
X_{10}	3.55	4.37	-0.82
X_{11}	3.59	4.28	-0.69
X_{12}	3.53	4.24	-0.71
X_{13}	3.5	4.27	-0.77
X_{14}	3.78	4.47	-0.69
X_{15}	3.76	4.37	-0.61
X_{16}	3.7	4.36	-0.67
X_{17}	3.77	4.4	-0.64
X_{18}	3.64	4.36	-0.72
X_{19}	3.59	4.47	-0.88
X_{20}	3.79	4.51	-0.72
X_{21}	3.61	4.4	-0.79
X_{22}	3.85	4.36	-0.51
X_{23}	3.63	4.23	-0.59
X_{24}	3.59	4.26	-0.67
X_{25}	3.63	4.39	-0.76

Table 5: Servqual value (gap score) without weight.

ability to analyze the disease (X_{19}). While the smallest expectation value was attribute X_1 (Convenient to inpatient unit location).

The analysis of servqual without weight was performed to find out how big the gap between perception and expectation of respondent

S. No	Attribute	Weight
1	X ₁	0.035
2	X ₂	0.0395
3	X ₃	0.0377
4	X ₄	0.0368
5	X ₅	0.0386
6	X ₆	0.0413
7	X ₇	0.0413
8	X ₈	0.0386
9	X ₉	0.035
10	X ₁₀	0.0431
11	X ₁₁	0.0404
12	X ₁₂	0.0386
13	X ₁₃	0.0395
14	X ₁₄	0.0413
15	X ₁₅	0.0413
16	X ₁₆	0.0413
17	X ₁₇	0.0413
18	X ₁₈	0.0422
19	X ₁₉	0.0413
20	X ₂₀	0.0449
21	X ₂₁	0.0413
22	X ₂₂	0.0395
23	X ₂₃	0.0395
24	X ₂₄	0.0386
25	X ₂₅	0.0413

Table 6: Weight value of attribute.

S. No	Attribute	Servqual without weight	Weight	Gap score
1	X ₁	-0.59	0.035	-0.0207
2	X ₂	-0.77	0.0395	-0.0304
3	X ₃	-0.48	0.0377	-0.0181
4	X ₄	-0.59	0.0368	-0.0217
5	X ₅	-1.12	0.0386	-0.0433
6	X ₆	-0.78	0.0413	-0.0322
7	X ₇	-0.77	0.0413	-0.0318
8	X ₈	-0.27	0.0386	-0.0104
9	X ₉	-0.9	0.035	-0.0315
10	X ₁₀	-0.82	0.0431	-0.0354
11	X ₁₁	-0.69	0.0404	-0.0279
12	X ₁₂	-0.71	0.0386	-0.0274
13	X ₁₃	-0.77	0.0395	-0.0304
14	X ₁₄	-0.69	0.0413	-0.0285
15	X ₁₅	-0.61	0.0413	-0.0285
16	X ₁₆	-0.67	0.0413	-0.0252
17	X ₁₇	-0.64	0.0413	-0.0277
18	X ₁₈	-0.72	0.0422	-0.0265
19	X ₁₉	-0.88	0.0413	-0.0364
20	X ₂₀	-0.72	0.0449	-0.0323
21	X ₂₁	-0.79	0.0413	-0.0327
22	X ₂₂	-0.51	0.0395	-0.0202
23	X ₂₃	-0.59	0.0395	-0.0233
24	X ₂₄	-0.67	0.0386	-0.0259
25	X ₂₅	-0.76	0.0413	-0.0314

Table 7: Result of final Servqual value (gap score).

to health service in Dr. Ramelan hospital. Based on the results of this calculation, the attribute X₅ (Cleanliness of the bathroom and availability of clean water) had the largest gap, this showed the biggest gap between the perception and expectations of respondents to this

attribute. While the smallest gap value was the attribute of Neatness and cleanliness of the appearance of doctors and nurses (X₈).

From the weighting of each attribute by the hospital management, the highest value of weight on attribute X₁₉ (The ability of doctors to analyze the disease) was obtained. While the lowest weight value was in the Convenient to Inpatient unit location (X₁) attributes. In the final result, a weighted servqual value with the highest gap was obtained in the attribute of Cleanliness of the bathroom and availability of clean water (X₅) with a score of -0.0433, The availability of doctors and nurses at the time of patient need (X₁₈) with a score of -0.0364, and attribute of Fast, accurate examination, treatment and treatment services (X₁₀) with a score of -0.0354. This indicated that these attributes should be a prioritized to improve service quality.

Conclusion

Based on the results and discussion above, the policy strategy that can be taken by hospital management to improve the quality of service was prioritizing service quality improvement on attribute X₅ (Cleanliness of the bathroom and availability of clean water), X₁₈ (The availability of doctors and nurses at the time of patient need) and attribute X₁₀ (Fast, accurate examination, treatment and treatment services). Attributes these services assessed by customers were the least quality.

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