



Assessment of Quality of Services Delivered to Iranian Patients with Cataract

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Abstract

Background: The expansion of activities and performance areas of organizations and modern management issues imply that organizations are no longer satisfied with success in only a limited number of elements. Mathematical models, thus, were formed and gradually developed for assessing organizations and providing the right tools.

Objectives: This study was conducted to provide a model for improving the quality of services to patients with cataracts.

Methods: The study population consisted of 20 experts in health service management in one group and 396 patients in another group. The data were used for the Importance-Performance Analysis (IPA). The first group consisted of 20 experts selected for the localization of the quality of services and the ISM. This applied descriptive-analytical study used the Fuzzy Delphi method for selecting the elements of the quality of services, the importance-performance analysis for identifying the strengths and weaknesses of these elements, and the Interpretive-Structural modeling for improving the elements of the quality of services by prioritizing the effect of the factors.

Results: The eye hospital has to pay immediate attention to elements including “reliability”, “support services”, “knowledge of personnel”, “waiting time”, “assurance”, “sympathy”, “decorum and modesty”, “understanding the patients”, “patients’ safety”, “continuous services”, “complaints management”, “cleanness/tidiness of environment,” and “rapid provision of services” to improve the quality of its services.

Conclusions: Interpretive structural modeling showed that two variables “technology and innovation” and “reliability” acted as the cornerstone of the model and they should be emphasized first and foremost for the system to begin functioning.

Keywords: Quality Assessment, Health Services, Patient Assessment, Cataract, Hospital Care

1. Background

The quality is considered a strategic tool by organizations (1). Quality is a vast concept to which all organizational departments are committed to preventing the emergence of quality-reducing factors. The ultimate goal of quality is the full compliance with the clients’ required specifications with minimum costs imposed on the organization and maximum client satisfaction (2). With the transformation of lifestyles and the mechanization of industrial production over the past decade, the majority of the workforce in industrial countries have now joined service organizations so that more than 75% of the workforce in the United States works in the service sector (3). Accordingly, management theories related to industrial settings have undergone modifications to apply to service organizations. The most important features of high-quality services include:

- 1) Clarifying the waiting time for the clients and providing services as promised;
- 2) Being complete and containing all the elements of the service;
- 3) Being respectful and delivered with a happy face;
- 4) Being delivered consistently at different times;
- 5) Being easily accessible;
- 6) Being delivered as initially defined;
- 7) Being delivered with a sense of responsibility at times of unforeseen events (4).

The healthcare sector, especially the organizational sector such as hospitals, is no exception to this rule if it wants to ensure the best quality of care (5). In addition, hospitals are the key units of any health system and play a key role in providing healthcare services (6).

The purpose of this study was to assess the quality of services provided to cataract patients in an Eye Hos-

pital (the largest ophthalmology hospital in Iran) using Importance-Performance Analysis (IPA) and to improve the elements of quality using Interpretive-Structural Modeling (ISM). The study also tried to determine the relationship and effects of the elements and boundaries of their effects in an attempt to improve satisfaction in cataract patients with the services of the hospital. The results may prepare the ground and momentum to move toward the objectives of WHO vision-2020 to eliminate the preventable loss of sight by 2020.

2. Objectives

The present study was conducted to provide a model for improving the quality of services to patients with cataracts in Tehran, Iran.

3. Methods

3.1. Study Design and Sampling Criteria

The present study is an applied study in terms of objective and a descriptive-analytical study in terms of data collection. The statistical population consisted of two groups. Group one included 10 ophthalmologists who were familiar with the subject, five researchers in the area of management of health medical services, and five researchers in the area of ophthalmic nursing. The participants in this group were selected through convenience sampling. Group two included hospitalized and outpatients diagnosed with cataract who visited the Cornea Clinic on different occasions. The study population was infinite. To determine the group sample size, a pilot study was carried out by administering the "quality of services from the patients' viewpoint questionnaire" among 30 patients with cataract (after surgery). With a variance of 0.539 (CL = 95%, error = 5%) in the pilot sample, the number of participants needed in the study was estimated at 446 patients including hospitalized and outpatients with cataract who were selected through convenience sampling.

Step one (obtaining opinions of experts): To determine the elements of quality of services, we conducted a literature review and interviews with experts (10 ophthalmologists familiar with the subject and 10 researchers in the area of health service management). Since there were too many elements, to determine the relative weight of inputs and to adjust the determined elements with the area under study, the experts' opinion was requested three times and adjustments were made at each step. Through this, was designed a Service Quality Questionnaire (SQQ) with 32

questions (one question for each element). The questionnaire was designed to determine the elements and importance of each element from the experts' points of view. The questionnaire was provided to 10 ophthalmologists, five researchers in the area of health medical services management, and five researchers in the ophthalmic nursing field working at an eye hospital. The questions were designed based on the five-point Likert scale. The SQQ was administered on three occasions to determine the elements based on the Fuzzy Delphi method. The elements for which the difference of scores between stages two and three was less than 0.2 and the mean total score was equal to 8 were selected for further analysis. At the second stage, the number of statements was increased to 36 based on the experts' opinion and at the third stage, 31 elements of the quality of medical services to the patients with the highest importance were selected.

Step two (patients' opinion): The questionnaire of the quality of services from the patients' points of view was designed based on the SQQ with the five-point Likert scale. In addition to the importance of each element of the quality of services, the questionnaire also measured the performance of the hospital in terms of that element from the patients' viewpoint. To measure the reliability of the questionnaire using Cronbach's alpha, 30 patients at the Cornea Clinic filled out the questionnaire and the alpha value was obtained equal to 0.76. For data gathering, the questionnaire was provided to the patients who visited the clinic for follow-up after their cataract surgery. Out of 443 questionnaires administered, 396 were returned.

For interpretive-structural modeling, 10 experts who met the criteria, including having a postgraduate degree, work experience, familiarity with the topic, and having published papers, were selected through convenience judgmental sampling. We designed the questionnaire of the weight of the elements of quality of services to patients with cataract and the validity of the questionnaire was examined by five ophthalmologists familiar with the topic of the quality of service and six researchers in the area of health service management. Cronbach's alpha of the questionnaire was obtained equal to 0.768 and there was a good correlation among the questions. The ISM method, which is an interpretive method, was used in the study; therefore, judgments by 10 experts were used to determine the relationship among the elements of the quality of services. The method is structural, as it is well given that the basis of relationships is a structure that is extracted from a complicated set of elements. The method is a modeling technique where the specific relationships and general structures are demonstrated in a digraph model. Descriptive re-

ports were generated in SPSS (Version 16) and data analyses and importance-performance matrix generation were conducted in Excel.

3.2. Data Analysis

The elements of the quality of services were identified in this study through a review of the literature and opinions of experts. IPA was then used in line with the objective of the study, i.e. the assessment of the quality of services. Table 1 shows the structure of an IPA matrix (7).

Table 1. The Importance-Performance Matrix

Importance	
High Importance Q1	Q2
Low Importance Q3	Q4

The four quadrants of this matrix are explained as follows:

1) Concentrate here; the respondents rate the elements as highly important, but the performance of the organization in these elements is rather low. Efforts for improvement and development should thus be concentrated in this area (7).

2) Keep up the good work; the respondents rate the elements as highly important and the organization has a very good performance with regard to these elements. Past performance should, therefore, be kept up in this area.

3) Low priority; the elements have low importance and low performance and limited resources should be allocated to this area by the organization.

4) Possible overkill; In view of the respondents, the elements in this quadrant are not very important, but enjoy relatively high performance. The respondents are happy with the organization's high performance in these elements, but the managers should dramatically reduce their current efforts with regard to these elements (8).

Next, ISM was used to find the priorities and levels of effectiveness and the interaction between the elements in a system for developing a graphic model.

3.3. Obtaining the Structural Self-Interaction Matrix (SSIM)

The dimensions of this matrix consist of the variables inserted into its first row and column in order. The pairwise relationships between the variables are then identified by symbols. Experts' views can be used to determine the type of relationships. These experts may be directors and professionals in the industry under study. The general form of this matrix is shown in Table 2.

To determine the type of relationship, the following symbols can be used:

- V — Helps variable I reach variable j (column)
- A — Helps variable J reach variable I (column)
- X — Helps I and J reach each other (reciprocal relationship)
- O — I and J are not related to each other

3.4. Obtaining the Reachability Matrix

The reachability matrix can be obtained by converting the relationship symbols of the SSIM matrix into zero and one according to the following rules:

If the relationship is such as in V, then $(i, j) = 1$ and so $(j, i) = 0$

If the relationship is such as in A, then $(i, j) = 0$ and so $(j, i) = 1$

If the relationship is such as in X, then $(i, j) = (j, i) = 1$

If the relationship is such as in O, then $(i, j) = (j, i) = 0$

3.5. Making the Reach Ability Matrix Consistent

Once the initial reachability matrix is obtained, an internal consistency has to be established in it. For example, if variable 1 leads to variable 2, and variable 2 leads to variable 3, then, variable 1 must also lead to variable 3, and if this relationship does not hold in the reachability matrix, then the matrix should be modified and the missing relationships should be replaced. The consistency of the reachability matrix is established using mathematical rules so that the reachability matrix is raised to the power of $K + 1$, where $K \geq 1$.

The exponentiation of the matrix should be 1 according to the Boolean rule, according to which $1 + 1 = 1$ and $1 \times 1 = 1$.

3.6. Determining the Level and Priority of Variables

The higher is the effect of one factor on the others, the lower is its place in ISM, and the more one factor is affected by others, the higher will be its place in ISM. Effectiveness occurs from low to high in ISM. To determine the level and priorities of the variables, the antecedent set and the intersection set are determined for each variable. The antecedent set for a variable includes variables that can be reached through this variable, and the intersection set includes variables through which this variable can be reached. This step is performed using the reachability matrix. Once the antecedent and intersection sets are determined for each variable, the common elements in these sets are identified for each variable (9). The result is shown in a table such as the following (Table 3).

Once the antecedent and intersection sets and common elements are determined, it is time to determine the variables' (elements') levels. In the first table, the variable

Table 2. The Structural Self-Interaction Matrix

Variable	N	-	6	5	4	3	2
1
2
3
4
5
-
m-1

Table 3. Determining the Variables' Levels

Elements	Antecedent Set	Intersection Set	Common Elements	Level
1
2
3
...
n

with perfectly similar antecedent and intersection sets has the highest level.

After determining this/these variable(s), they are eliminated from the table, and the next table is formed by the remaining variables. The level-two variable is identified in the second table just as in the first table, and the process continues until all variables' levels are assigned.

3.7. Plotting the Diagram

When the variable levels are determined, the diagram of the relationships and levels of the variables is plotted. First, the variables are plotted as a circle from top to bottom according to the priorities obtained and their levels and then, based on the consistent reachability matrix, the relationships between the variables are identified with arrows (9).

3.8. MICMAC Analysis

The purpose of MICMAC analysis is to determine and analyze the driving power and dependence of the variables. In this analysis, variables are divided into four groups based on their driving power and dependence. Group one consists of "independent variables" that have a poor driving power and dependence. These variables have almost no link to the system and have poor relations with the system. The second group consists of "dependent variables" that have a poor driving power, but a high dependence. The third group consists of "linkage variables" that

have a high driving power and dependence. These variables are non-static, since any change in them can affect the system, and the system's feedback can, in turn, change the variables once again. The fourth group consists of "independent variables" that have a high driving power but a low dependence (9).

4. Results

First, through a review of the literature, the elements of the quality of services to the patients were identified, including 31 elements as shown in Table 4.

To determine the degree of importance-performance of the elements based on the five-point Likert scale, the views expressed by 396 patients were integrated (aggregated) and the importance-performance value of the elements affecting the quality of services to the patients with cataract was obtained (Table 5). As the data analyses showed, 45.5% of the respondents were male and 54.5% were female. As to the age of developing cataract, the disease inflicted 13.3% at the age below 50-years-old and 12% at the age above 50 years.

The IPA matrix was then drawn (Figure 1).

According to the results presented in Table 5, the performance score of "accessibility" with 2.697 was higher than the value amount (2.452); this means that the organization had high performance in terms of accessibility from the patients' points of view. Moreover, the importance value of this element was equal to 3.28, which was higher

Table 4. The Key Elements of Successful Provision of Quality Services to Patients

Number	Element	Description	Reference	Elements that Need Further Improvement for ISM
1	Accessibility	Easy access to the place	(10, 11)	*
2	Reliability	Accuracy in providing the service	(10, 12)	*
3	Privacy	Respecting the privacy of patients	(12, 13)	*
4	Comprehensiveness	Meeting a wide range of needs	(7, 10)	*
5	Support services	Managing patients' problems and recommendations	(7, 11, 12)	*
6	Knowledge of personnel	Knowledge and information of the personnel to answer questions asked by patients	(7, 14)	*
7	Waiting time	Provision of the services as scheduled	(11-13)	
8	Responsiveness	Being responsive and helpful to cover the patient's needs	(12, 13)	
9	Tangible items	Utilization of equipment and facilities in the organization	(13, 14)	
10	Assurance	The extent to which the physician assures the patients' satisfaction with treatment	(10, 11, 14)	*
11	Sympathy	Demonstrating and paying special and close attention to patients, recognizing patient's values and preferences, paying special attention to vulnerable and risky patients	(13, 14)	
12	The clean and neat appearance of personnel	The clean and neat appearance of personnel	(7, 10)	
13	Flexibility	Volume and extent of available services	(14)	
14	Decorum and modesty	Showing decorum, respect, attention, and friendly behavior towards patients	(10, 12)	*
15	Communication	Informing patients about the services in a perceivable way	(11, 14)	
16	Understanding the patients	Trying to perceive special and unique needs and wants of the patients, paying personal attention to patients, perceiving their needs	(10, 14)	*
17	Rapid provision of services	Providing services as scheduled	(7, 11, 14)	*
18	Patient safety	The rate of developing side-effects is at or below the standard level	(7, 10, 11)	*
19	Continuous services	Continuous provision of services to support further visits	(7, 12, 13)	*
20	Integrity and honesty	Honesty with patients	(7, 8, 14)	
21	Complaint management	Complaint management	(7, 14)	*
22	Law obedience	Respecting laws, regulations, and codes of conduct and avoiding discriminating the patients	(3, 10, 14)	
23	Accuracy of services	Accurate results and prevention of frequent errors	(3, 7, 14)	
24	financial issues	Paying attention to financial capacity to pay the costs	(3, 7, 12)	
25	Paying attention to personal matters	Paying attention to relatively personal issues of patients	(11, 12)	
26	Public information services	Providing adequate information to the family or relatives about cares	(7)	
27	Clean/tidy environment	Cleanness/tidiness of the clinic and hospital	(7, 11, 13)	*
28	Technology and innovation	Using new techniques of surgery and state-of-art technologies for providing services	(12, 15)	*
29	Monitoring and feedback	Monitoring patients after the surgery	Recommended by the experts	
30	Values	Treating patients based on their ethnic group (Kurd, Lor, Arab, etc.)	Recommended by the experts	
31	Confidentiality of information	Respecting confidentiality about the diseases and patient file	Recommended by the experts	

than the value amount (3.179). This means that this element was highly important for patients. As shown in the IPA matrix, the key factors involved in the improvement of

the quality of services to the patients with cataract can be categorized as follows:

- Quadrant I (“Concentrate here”) contains elements

High	Reliability”, “support services”, “knowledge of personnel”, “waiting time”, “assurance”, “sympathy”, “decorum and modesty”, “understanding and knowing the patients”, “patients’ safety”, “continuous services”, “complaints management”, “cleanness/tidiness of environment,” and “rapid provision of services” Quarter 1- concentrate here	“Accessibility,” “privacy,” “comprehensiveness,” and “technology and innovation” Quarter 2- keep up the good work
	“Integrity and honesty,” “financial,” “public information services,” and “confidentiality of information”	“Responsiveness,” “tangible services,” “clean and neat apparence of personnel,” “flexibility,” “communication,” Law obedience,” “accuracy of services,” “paying personal attention to patients,” “feedback control,” and “values”
3.179		
Low	Quarter three- low priority	Quarter four- possible overkill
	Low	High

Figure 1. Importance-performance matrix of the elements of quality of services to patients with cataract

C2, C5, C6, C7, C10, C11, C14, C16, C17, C18, C20, C29, and C31.

The organization should concentrate on where the importance is high and the performance is low and pay immediate attention to these elements to improve customer satisfaction with the quality of services.

- Quadrant II (Keep up the good work) contains elements C1, C3, C4, and C30, which indicates the organization’s main area of strength and recommends keeping up that quality.

- Quadrant III (Lower priority) contains elements C19, C23, C27, and C28. The managers should not pay too much attention to this area and should spend only limited resources on it.

- Quadrant IV (Possible overkill) contains elements C8, C9, C12, C13, C15, C21, C22, C24, C25, and C26. The concentration in this area is a waste of resources.

The next step after identifying the factors that have a weak role in improving the quality of services to patients with cataracts is to improve on them. The organization should improve the elements placed in quadrant one to achieve customer satisfaction. This study used ISM for achieving this improvement.

Interpretive structural modeling identifies the relationships and partitioning between the variables for solving the problem and achieving improvement. The vari-

ables in quadrant II are therefore used to help improve the variables in quadrant I (continue) that require improvement.

As a result, ISM starts with the elements in quadrants I and II. But, first, the SSIM of the variables should be developed. The dimensions of the SSIM consist of factors that are inserted into the matrix’s first row and column, in order. The pairwise relationships between the factors are then identified. The following scale can be used in determining these relationships. A row factor can lead to a column factor. The views of 10 experts with the full knowledge of the study subject were then used and the results obtained were summarized in SSIM.

The reachability matrix was obtained by determining the relationships as 0 and 1 from SSIM with a threshold of 50. In Table 6, the numbers higher than 20 are placed as 1 and the numbers less than 20 are placed as 0. After the addition of the identity matrix, the reachability matrix was developed, as shown in Table 7. Once the initial reachability matrix is obtained, its internal consistency should be established.

Boolean rules were used for this purpose. Table 8 shows the consistency matrix. The level and priority of the variables were determined by the sum of the rows (driving power = D) and columns (dependence = R) in the consis-

Table 5. Importance-Performance Value of the Elements of Quality of Services to Cataract Patients

Element	Performance	Importance	Code
Accessibility	2.697	3.281	C1
Reliability	2.357	3.291	C2
Privacy	2.907	3.341	C3
Comprehensiveness	2.692	3.258	C4
Support services	2.264	3.238	C5
Knowledge of personnel	2.372	3.386	C6
Waiting time	2.339	3.225	C7
Responsiveness	2.785	3.056	C8
Tangible items	2.689	2.981	C9
Assurance	2.196	3.545	C10
Sympathy	2.401	3.801	C11
The clean and neat appearance of personnel	2.603	3.023	C12
Flexibility	2.78	3.144	C13
Decorum and modesty	2.31	3.251	C14
Communication	2.638	2.883	C15
Understanding the patients	2.294	3.752	C16
Patient safety	2.35	3.199	C17
Continuous services	2.291	3.207	C18
Integrity and honesty	2.399	2.952	C19
Complaint management	2.397	3.407	C20
Law obedience	2.691	3.034	C21
Accuracy of services	2.647	3.055	C22
financial issues	2.415	2.785	C23
Paying attention to personal matters	2.574	3.031	C24
Monitoring and feedback	2.664	2.938	C25
Values	2.815	2.807	C26
Public information services	2.287	3.172	C27
Confidentiality of information	2.409	2.941	C28
Cleanness/tidiness of environment	1.931	3.315	C29
Technology and innovation	2.233	3.287	C30
Rapid provision of services	1.947	3.234	C31
Value amount	2.452	3.179	-

tency matrix. Table 8 shows the results. After determining the relationships and variable levels, they can be drawn as a model. To this end, the variables are first drawn from high to low according to their levels.

In the present study, the elements affecting the quality of services provided to the patients with cataracts were

placed in 10 levels. Figure 2 shows the interpretive structural model for partitioning the key factors for improving the quality of services provided to patients with cataracts. “Technology and innovation” and “reliability” are at the lowest level of this model and act as its cornerstone, and the improvement of the quality of services begins with these variables and spreads to the other variables. These variables are interrelated. Level nine is home to “comprehensiveness” and “accessibility.” Once again, these elements are interrelated and affect those at level eight. The next level hosts “cleanness and tidiness of environment” and level seven hosts “knowledge of personnel.” The elements at level eight influence those at level seven. Level six is occupied with “assurance” and it affects the elements at level five. The next level (level five) is filled by “understanding the patients”, “decorum and modesty”, “sympathy”, and “privacy” and all these elements are affected by the elements of the lower level. Level four is filled by “rapid provision of services”, “waiting time” and level three is filled by “complaint management” and “patient safety.” These elements are affected by those of the previous level and affect those at level two “support services.” Additionally, the elements at level two affect those at level one (continuous services), which leads to satisfaction in patients with medical services. The element “continuous services” is the outcome of the effective measures by the hospital to make the patients satisfied with the medical team (Figure 2).

Figure 3 shows the driving power and dependence of the elements affecting improvement in the quality of services provided to patients with cataracts.

The first category includes autonomous elements with low driving power and receive power. Elements in this category are relatively detached from the system and have a low and weak relationship with the system. That is, these elements induce and receive the lowest impact. None of the elements in this study were categorized in this category, which is an indicator if there is a relationship between the elements of the quality of services to patients with cataract and satisfaction of the patients with the services.

Elements “supportive services”, “waiting time”, “patient’s safety”, “continuous services”, and “complaint management” were in the dependent category. These elements codify the elements of satisfaction with medical services in patients. There are several factors affecting satisfaction with medical services. These elements barely create the ground for other elements. These elements are affected by other elements and they need more attention from the hospital for improvement.

Elements “privacy”, “sympathy”, “decorum and mod-

Table 6. Structural Self-Interaction Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	0	8	22	25	27	25	21	27	0	24	24	0	25	28	21	9	20
2	22	0	28	28	23	0	29	26	28	26	25	27	30	27	20	25	29
3	11	9	0	8	21	8	25	12	23	28	0	28	29	25	9	14	24
4	25	15	27	0	29	30	24	24	30	29	26	0	30	23	27	15	28
5	18	14	8	9	0	9	6	14	6	8	14	15	24	8	11	13	10
6	5	9	26	12	30	0	26	25	24	26	28	29	0	29	18	15	26
7	14	18	12	14	21	12	0	15	5	14	15	30	26	25	12	17	29
8	5	15	23	15	30	18	27	0	24	22	21	21	28	24	14	12	27
9	9	12	29	17	28	15	25	5	0	21	28	24	26	23	15	9	21

Table 7. Reachability Matrix After Implementing Consistency

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1	0	1	1	1	1	1	1	1*	1	1	1*	1	1	1	0	1
2	1	1	1	1	1	1*	1	1	1	1	1	1	1	1	1	1	1
3	0	0	1	0	1	0	1	0	1	1	1*	1	1	1	0	0	1
4	1	0	1	1	1	1	1	1	1	1	0	1*	1	1	1	0	1
5	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
6	0	0	1	0	1	1	1	1	1	1	1	1	1*	1	0	0	1
7	0	0	0	0	1	0	1	0	0	0	0	1	1	1	0	0	1
8	0	0	1	0	1	0	1	1	1	1	1	1	1	1	0	0	1
9	0	0	1	0	1	0	1	0	1	1	1	1	1	1	0	0	1
10	0	0	1	0	1	0	1	0	1	1	1	1	1*	1	0	0	0
11	0	0	1	0	1	0	1	0	1	1	1	1	1	1	0	0	1
12	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
14	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0
15	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1
16	1	1	1	1	1	1	1	1	1	1	1	1	1*	1	1	1	1
17	0	0	0	0	0	1	0	1	0	0	0	1	1	10	0	0	1

esty”, and “understanding the patients” were in the linkage category so that they have higher driving power and receive power. These elements are unstable and constitute the mediator elements as any change in them can affect the system and the system’s feedback, in turn, affects them.

Elements “accessibility”, “reliability”, “comprehensiveness”, “assurance”, “cleanness/tidiness of environment”, and “technology and innovation” were in the independent category. These elements make improvements in other elements and they act as key and base elements of the model. To make the system functional, these elements are of top priority.

5. Discussion

According to Lee et al. (8), the main elements for improving the quality of medical services include the medical team, expert pharmacists, professional nurses, and the speed and quality of providing medical services. Lee (16) also confirmed the importance of quality assessment in a competitive health care setting. Thus, in this study, the results of data analyses using IPA showed that the hospital needed to pay more attention to elements “reliability”, “supportive services”, “knowledge of personnel”, “waiting time”, “assurance”, “sympathy”, “decorum and modesty”, “understanding the patients”, “patient’s safety”,

Table 8. The Level of Elements of Quality of Services Provided to Patients with Cataract

Elements	Code	Driving Power (D)	Receive (R)	D + R	Net D and R (D-R)	Rank
Accessibility	C1	15	4	19	11	9
Reliability	C2	17	2	19	15	10
Security or privacy	C3	10	11	21	-1	5
Comprehensiveness	C4	15	4	19	11	9
Support services	C5	2	16	18	-14	2
Knowledge of personnel	C6	12	6	18	6	7
Waiting time	C7	6	13	19	-7	4
Assurance	C8	11	7	18	4	6
Sympathy	C9	10	11	21	-1	5
Decorum and modesty	C10	10	11	21	-1	5
Understanding the patients	C11	10	11	21	-1	5
Patient safety	C12	4	15	19	-11	3
Continuous services	C13	1	17	18	-16	1
Complaint management	C14	4	15	19	-11	3
Cleanness/tidiness of environment	C15	13	5	18	8	8
Technology and innovation	C16	17	2	19	15	10
Rapid provision of services	C17	6	13	19	-7	4

“continuous services”, “complaint management”, “clean-ness/tidiness of environment”, and “rapid provision of services” in providing medical services to patients with cataract.

The element “reliability” refers to accuracy in provid- ing services and represents the patient’s trust in the physi- cian, diagnosis skills, treatment, and physician’s ability to find a suitable treatment rapidly. The results showed that this element was highly important while the performance of the hospital in this regard was not good.

The next objective of the study was to determine the variable levels and their effectiveness in improving the quality of services provided to patients with cataracts. We used ISM to achieve this objective and the classification was analyzed. The results showed that the elements affecting the quality of services provided to patients with cataracts are placed in 10 levels, starting with “technology and inno- vation” and “reliability” and ending with “continuous ser- vices.” Phaco surgery is the standard surgery for cataracts. The surgery is an outgoing operation and does not need stitches or anesthetic drops. The Eye Hospital uses the lat- est technology for cataract surgeries, which is an advan- tage of this hospital.

Karimi Shirazi et al. (17) studied the improvement of quality of dental services using IPA and ISM and re- ported that technology was one of the key factors. Motaghi

and Kouchaki (18) reported that the element “reliability” needed more improvement and attention.

5.1. Conclusions

The element “accessibility” obtained a value of 2.697, which means that the organization was in good condition in terms of “accessibility” performance from the patients’ points of view. This is due to the adequate guiding signs and lines that guide the patients easily to the ward they need. In terms of importance, the element “accessibility” obtained 3.28 points, which is again higher than the value amount (3.179). That is, the element is highly important for the patients. Based on the importance-performance matrix, the element “understanding the patients” with the weight of 0.074 was in the first quarter, indicating impor- tance is high and performance is low. Holding educational courses on professional behavior for medical and adminis- trative personnel of the hospital is proposed to enable the personnel to understand and survey the patients’ needs. The element “reliability” means accuracy in providing ser- vices and covers trust in the physician, the ability to diag- nose and treat patients, and the physician’s speed in find- ing a suitable treatment for patients. To make an improve- ment with regard to this element, holding seminars and retraining courses in the fields of expertise are essential to keep the personnel and physicians updated. To gain the

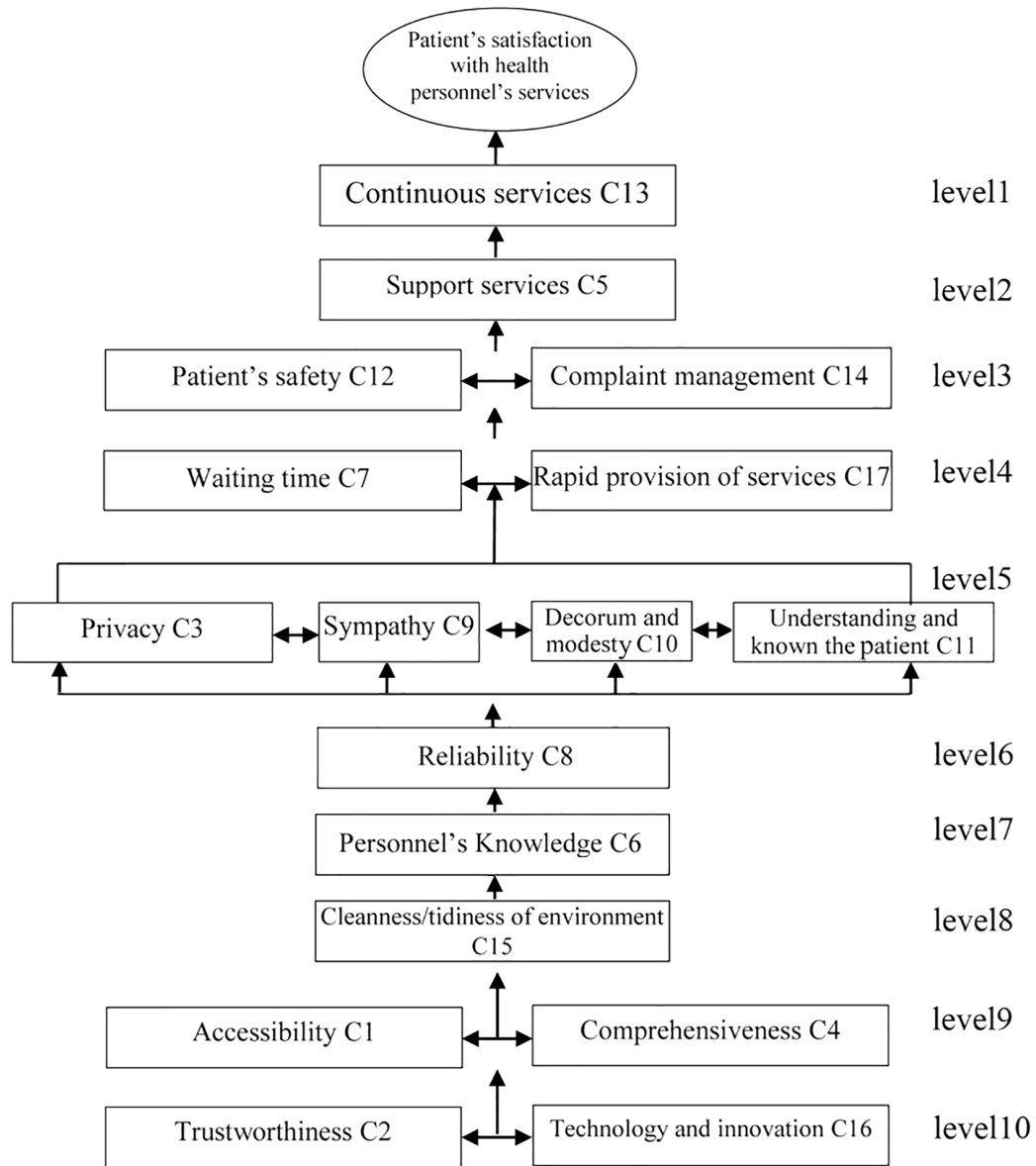


Figure 2. The interpretive-structural model for improving the quality of services provided to patients with cataract

trust of patients, physicians need to explain the treatment process to the patients and elucidate how to use drops and drugs in the case of severe inflammation of the eyes. The element “continuous services” means the availability of services to support further demand for services by the patient. This element was one of the effective and dependent elements and needed more attention to improving. Each patient that undergoes phacoemulsification surgery should be informed of follow-up visits in the hospital and how to

handle the side-effects.

Since making improvements based on merely one criterion is always very risky, it is suggested that several elements be used simultaneously for improving the quality of services provided to patients with cataracts.

Driving Power	17	Independent elements "accessibility", "reliability", "comprehensiveness", "assurance", "cleanness/tidiness of environment", and "technology and innovation"	Linkage elements "privacy", "sympathy", "decorum and modesty", and "understanding and knowing patients"
	12		
	8.5	Autonomous elements	Dependent elements
	4		"support services", "waiting time", patient's safety", "continuous services", "complaint management"
	1		
		1 3 8.5 12 17	
		Depending Power	

Figure 3. Driving-dependence power analysis

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Footnotes

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References

- Meesala A, Paul J. Service quality, consumer satisfaction and loyalty in hospitals: Thinking for the future. *J Retailing Consum Serv*. 2018;**40**:261-9. doi: [10.1016/j.jretconser.2016.10.011](https://doi.org/10.1016/j.jretconser.2016.10.011).
- Lupo T. A fuzzy framework to evaluate service quality in the healthcare industry: An empirical case of public hospital service evaluation in Sicily. *Appl Soft Comput*. 2016;**40**:468-78. doi: [10.1016/j.asoc.2015.12.010](https://doi.org/10.1016/j.asoc.2015.12.010).

- Shafii M, Rafiei S, Abooe F, Bahrami MA, Nouhi M, Lotfi F, et al. Assessment of service quality in teaching hospitals of Yazd University of Medical Sciences: Using multi-criteria decision making techniques. *Osong Public Health Res Perspect*. 2016;**7**(4):239-47. doi: [10.1016/j.phrp.2016.05.001](https://doi.org/10.1016/j.phrp.2016.05.001). [PubMed: [27635374](https://pubmed.ncbi.nlm.nih.gov/27635374/)]. [PubMed Central: [PMC5014758](https://pubmed.ncbi.nlm.nih.gov/PMC5014758/)].
- Babakus E, Inhofe M. Measuring perceived service quality as a multi-attribute attitude. *Proceedings of the 1993 Academy of Marketing Science (AMS) Annual Conference*. Germany. Springer, Cham; 2015. p. 376-80.
- Handayani PW, Hidayanto AN, Sandhyaduhita PI, Ayuningtyas D. Strategic hospital services quality analysis in Indonesia. *Expert Syst Appl*. 2015;**42**(6):3067-78. doi: [10.1016/j.eswa.2014.11.065](https://doi.org/10.1016/j.eswa.2014.11.065).
- Zarei E, Daneshkohan A, Pouragha B, Marzban S, Arab M. An empirical study of the impact of service quality on patient satisfaction in private hospitals, Iran. *Glob J Health Sci*. 2014;**7**(1):1-9. doi: [10.5539/gjhs.v7n1p1](https://doi.org/10.5539/gjhs.v7n1p1). [PubMed: [25560338](https://pubmed.ncbi.nlm.nih.gov/25560338/)]. [PubMed Central: [PMC4796458](https://pubmed.ncbi.nlm.nih.gov/PMC4796458/)].
- Mohebibfar R, Hasani H, Barikani A, Rafiei S. Evaluating service quality from patients' perceptions: Application of importance-performance analysis method. *Osong Public Health Res Perspect*. 2016;**7**(4):233-8. doi: [10.1016/j.phrp.2016.05.002](https://doi.org/10.1016/j.phrp.2016.05.002). [PubMed: [27635373](https://pubmed.ncbi.nlm.nih.gov/27635373/)]. [PubMed Central: [PMC5014747](https://pubmed.ncbi.nlm.nih.gov/PMC5014747/)].
- Lee YC, Wu HH, Hsieh WL, Weng SJ, Hsieh LP, Huang CH. Applying importance-performance analysis to patient safety culture. *Int J Health Care Qual Assur*. 2015;**28**(8):826-40. doi: [10.1108/IJHCQA-03-2015-0039](https://doi.org/10.1108/IJHCQA-03-2015-0039). [PubMed: [26440485](https://pubmed.ncbi.nlm.nih.gov/26440485/)].
- Sindhu S, Nehra V, Luthra S. Identification and analysis of barriers in implementation of solar energy in Indian rural sector using integrated ISM and fuzzy MICMAC approach. *Renewable Sustainable Energy Rev*. 2016;**62**:70-88. doi: [10.1016/j.rser.2016.04.033](https://doi.org/10.1016/j.rser.2016.04.033).
- Li M, Lowrie DB, Huang CY, Lu XC, Zhu YC, Wu XH, et al. Evaluating patients' perception of service quality at hospitals in nine Chinese cities by use of the ServQual scale. *Asian Pac J Trop Biomed*. 2015;**5**(6):497-504. doi: [10.1016/j.apjtb.2015.02.003](https://doi.org/10.1016/j.apjtb.2015.02.003).
- Singh A, Prasher A. Measuring healthcare service quality from patients' perspective: Using fuzzy AHP application. *Total Qual Manage Bus Excellence*. 2017;**30**(3-4):284-300. doi: [10.1080/14783363.2017.1302794](https://doi.org/10.1080/14783363.2017.1302794).
- Al Fraihi KJ, Latif SA. Evaluation of outpatient service quality in Eastern Saudi Arabia. Patient's expectations and perceptions. *Saudi Med J*. 2016;**37**(4):420-8. doi: [10.15537/smj.2016.4.14835](https://doi.org/10.15537/smj.2016.4.14835). [PubMed: [27052285](https://pubmed.ncbi.nlm.nih.gov/27052285/)]. [PubMed Central: [PMC4852020](https://pubmed.ncbi.nlm.nih.gov/PMC4852020/)].
- Izogo EE, Ogba IE. Service quality, customer satisfaction and loyalty in automobile repair services sector. *Int J Qual Reliab Manage*. 2015;**32**(3):250-69. doi: [10.1108/ijqrm-05-2013-0075](https://doi.org/10.1108/ijqrm-05-2013-0075).
- Famiyeh S, Kwarteng A, Asante-Darko D. Service quality, customer satisfaction and loyalty in automobile maintenance services. *J Qual Maint Engin*. 2018;**24**(3):262-79. doi: [10.1108/jqme-10-2016-0056](https://doi.org/10.1108/jqme-10-2016-0056).
- Yin SY, Huang KK, Shieh JJ, Liu YH, Wu HH. Telehealth services evaluation: A combination of SERVQUAL model and importance-performance analysis. *Qual Quant*. 2015;**50**(2):751-66. doi: [10.1007/s1135-015-0174-4](https://doi.org/10.1007/s1135-015-0174-4).
- Lee DH. Healthqual: A multi-item scale for assessing healthcare service quality. *Serv Bus*. 2016;**11**(3):491-516. doi: [10.1007/s11628-016-0317-2](https://doi.org/10.1007/s11628-016-0317-2).
- Karimi Shirazi H, Modiri M, Pourhabibi Z, Rafiei Gilevae A. Improving the quality of clinical dental services using the importance-performance analysis (IPA) approach and interpretive-structural modeling (ISM). *J Dentomaxillofacial Radiol Pathol Surg*. 2016;**6**(1):14-26.
- Motaghi M, Kouchaki E. Education services quality of Kashan Medical Science University, based on SERVQUAL model in viewpoints of students. *Int Arch Health Sci*. 2017;**4**(4):84. doi: [10.4103/jahs.iahs_9_17](https://doi.org/10.4103/jahs.iahs_9_17).