Bali Medical Journal (Bali Med J) 2016, Volume 5, Number 2: 298-302
P-ISSN.2089-1180, E-ISSN.2302-2914

Published by DiscoverSys

Evaluation and prioritization of service quality dimensions using Dematel and Topsis

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ABSTRACT

Background: Hospital services quality plays an increasingly important role in today's competitive environment. This study aimed to evaluate causal effects of different healthcare quality aspects on quality of services perceived by patients in hospitals affiliated by Shahid Sadoughi University of Medical Sciences using DEMATEL and TOPSIS techniques in 2014.

Method: Through literature review and expert opinions, different service quality dimensions in under study hospitals were identified and required data were gathered. In the next step, DEMATEL technique was applied to determine cause and effect relationships between identified quality aspects and quality perceived by service recipients. Also to rank dimensions according to their priorities, TOPSIS method was used. Given the literature review, six quality dimensions including responsiveness, assurance, security, tangibility, communication and patient centeredness were identified.

Result: Results obtained from DEMATEL technique introduced patient security as an influential aspect which was ranked in the sixth place in terms of importance.

Conclusion: The prioritization of quality dimensions along with their causal effects provides a beneficial insight for hospital managers to effectively plan and make improvement decisions. It is suggested that considering a remarkable impact of security on patients' perception toward quality of care, this aspect should be regarded in decision makers' programs with a greater emphasis.

Keywords: quality, dimension, DEMATEL, TOPSIS, prioritize

Cite This Article: Khanjankhani, K., Rafiei, S., Ezzatabadi, M., Askari, R., Abooee, F., Shafii, M. 2016. Evaluation and prioritization of service quality dimensions using Dematel and Topsis (A Case Study in Iran). *Bali Medical Journal* 5(2): 298-302. DOI:10.15562/bmj.v5i2.233

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INTRODUCTION

Worldwide, healthcare is regarded as one of the fastest developing services.[1] Provision of high quality healthcare services as an important factor acts as a competitive advantage which ultimately brings customer loyalty.[2] Although healthcare industry has changed over recent years but certainly the impact of quality is still undeniable on growth, success and maintenance of health provider organizations.[3] Increase in sensitivity of people toward health services' quality also special attention given to this topic has led to great efforts seeking for service quality assessments with the aim of achieving possible level of excellence.[4] In the absence of health services tangibility, it is difficult to understand how patients perceive service quality or evaluate its different aspects.[5] Service is defined as an intangible benefit offered by an individual or institutional provider with a multi-dimensional structure in terms of quality.[4] Gronroos introduced technical and performance quality as two major components in service quality. The first component mainly focuses on technical accuracy of medical diagnosis or processes, while the latter refers to the way services are carried out.[6] In fact quality declares the degree to which healthcare interventions are provided according to patients' clinical needs and how service providers fulfil customers' expectations in a proper manner.[7,8]

Since provision of healthcare is one of the main indicators of human development and specialized knowledge and skills are required in this field of services, it is important to constantly measure and ensure improvement in quality of services provided for care recipients.[4] In this regard evaluating patients' expectations is a key factor which should be mentioned in quality assessment.[9] Analysis of main components affecting health services quality reflects the overall changing trend in the importance of different quality aspects in a healthcare system.[10] On the other hand, quality of services is one of the main factors affecting patient satisfaction.[11] Therefore the necessity of being aware of existing shortcomings in healthcare services particularly from patients' points of view highlighted the remarkable importance of evaluating and measurement of healthcare quality dimensions.[8]

Several methods have been proposed to measure quality of health services which often face with uncertainty. To overcome such ambiguities due to human judgments, multiple-criteria decision making models (MCDM) and Fuzzy theories have been introduced.[12] In this study, DEMATEL

technique and TOPSIS method were used to evaluate hospital services' quality. DEMATEL technique was proposed by Fontela and Gabus in 1971 to determine causal relations among different aspects of a system to find out their complex relationships and construct an impact relation map (IRM).[13]

Such a technique enhances managers' competency to effectively make decision in complex, interrelated situations facing with vagueness of human judgments.[14]

TOPSIS model has been introduced by Hwang and Yoon in 1993 as a multi-criteria decision making technique being able to rank a set of factors through weighing their importance and prioritizing them in a definite order.[15,16] In this study, we aimed to evaluate inter-relational effects of different healthcare quality dimensions in hospitals affiliated by Shahid Sadoughi University of Medical Sciences in 2014 using DEMATEL technique and TOPSIS model.

MATERIAL AND METHODS

This was a descriptive, cross sectional study conducted in 2014 in hospitals affiliated by Shahid Sadoughi University of Medical Sciences. First a literature review was done to determine hospital quality dimensions. To do so, scientific databases of Google Scholar, Science Direct and PubMed were reviewed using keywords of service quality, hospital, healthcare services and SERVQUAL analysis in an English language in the time period 1990-2014. In total, 58 articles with the most similar topic were found. As a result all affecting factors and contributing quality aspects were extracted among which those with more frequency of repetition and better suited for hospital environments were selected. Then through analyzing 42 experts' opinions including hospital managers, supervisors and technical officials of under study hospitals, final version of quality dimensions comprised of 29 criteria in six categories was obtained. Once quality dimensions list was finalized, patients' perception was needed to be analyzed. To this aim, a two section questionnaire including one part gathering data on demographic characteristics of patients and the second contained 29 questions with 5-point Likert scaling system was designed. The scale ranged from 1 "strongly unimportant" to 5 "strongly important". Content validity of the questionnaire was assured by an expert team and its reliability was checked through Cronbach's alpha calculated as 92%. A total of 300 patients were contributed in the study to evaluate perceived service quality from their points of view.

Random sampling was used to collect the data so considering the allocation of patient admitted to each hospital based on proportion of the number of patient and wards, the sample for each hospital were extracted and the questionnaire was used for the patients. To ensure the realization of hospital services quality perceived by study participants, those who were hospitalized for at least three days also were conscious and able to understand and respond questions were included in the research. Finally the data gathered were analyzed using TOPSIS method and Excel software. In the last phase of study a DEMATEL technique was applied to determine causal effects of quality dimensions and intensity of their relative impacts on patients' perception toward quality of healthcare services.

RESULTS

Results showed that most of the participants (50.3%) were male, 36.6% belonged to 25-30 age group and 48% were under diploma.

Findings obtained from DEMATEL technique revealed that affecting aspects on service quality in hospital A were as following in order of importance: security (4.20), patient centeredness (3.69), communication (3.53), assurance (3.46), responsiveness (3.28) and tangibility (3.10) (Table 1 and Figure 1).

Figure 1 depicts that those quality dimensions placing above the zero line (including security, assurance and communication) had significant influence on patients' perceived quality; but those

Table 1 **Relative Impact Intensity Matrix of Health Services Quality Dimensions in Hospital A**

Quality Dimensions	Responsiveness	Assurance	Security	Tangibility	Communication	Patient Orientation	D	R	Di+Ri	Di-Ri	Impact Intensity
Responsiveness	0.21	0.16	0.24	0.38	0.17	0.36	1.55	1.72	3.28	-0.16	5
Assurance	0.40	0.20	0.36	0.53	0.35	0.60	2.46	1.00	3.46	1.46	4
Security	0.44	0.26	0.31	0.61	0.33	0.55	2.52	1.67	4.20	0.85	1
Tangibility	0.12	0.05	0.09	0.15	0.08	0.12	0.62	2.47	3.10	-1.84	6
Communication	0.36	0.19	0.38	0.49	0.22	0.55	2.22	1.31	3.53	0.91	3
Patient Orientation	0.17	0.12	0.26	0.29	0.14	0.24	1.24	2.45	3.69	-1.20	2

Table 2 Relative Impact Intensity Matrix of Health Services Quality Dimensions in Hospital B

Quality Dimensions	Respon-siveness	Assu-rance	Secu-rity	Tangi-bility	Commu-nication	Patient Orientation	D	R	D_i+R_i	D_i-R_i	Impact Intensity
Responsiveness	0.84	1.01	0.73	1.16	0.95	0.79	5.49	5.18	10.67	0.31	2
Assurance	0.90	0.88	0.77	1.19	0.94	0.78	5.47	5.45	10.92	0.02	1
Security	0.89	0.89	0.67	1.15	0.85	0.83	5.28	4.20	9.49	1.08	6
Tangibility	0.72	0.75	0.54	0.78	0.63	0.55	3.98	6.60	10.57	-2.62	3
Communication	0.77	0.83	0.68	1.01	0.71	0.68	4.69	5.07	9.76	-0.39	5
Patient Orientation	1.05	1.08	0.81	1.29	0.99	0.79	6.01	4.42	10.43	1.59	4

Table 3 Relative Impact Intensity Matrix of Health Services Quality Dimensions in Hospital C

Quality Dimensions	Respon-siveness	Assu-rance	Secu-rity	Tangi-bility	Commu-nication	Patient Orientation	D	R	D_i+R_i	D_i-R_i	Impact Intensity
Responsiveness	0.30	0.20	0.20	0.41	0.26	0.27	1.64	2.36	4.00	-0.72	1
Assurance	0.49	0.26	0.32	0.56	0.41	0.43	2.46	1.30	3.77	1.16	4
Security	0.53	0.31	0.26	0.68	0.48	0.47	2.72	1.24	3.96	1.48	2
Tangibility	0.28	0.14	0.11	0.25	0.23	0.16	1.17	2.70	3.87	-1.53	3
Communication	0.35	0.21	0.17	0.37	0.25	0.27	1.62	1.96	3.58	-0.34	6
Patient Orientation	0.42	0.18	0.18	0.45	0.33	0.25	1.82	1.84	3.66	-0.02	5

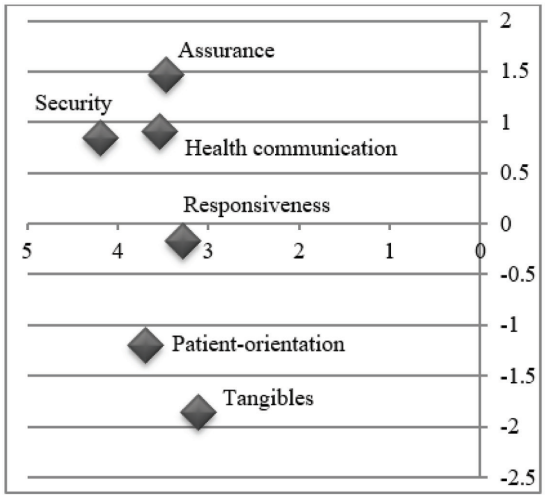

Figure 1 A Causal Graph Related to Service Quality Dimensions of Hospital A

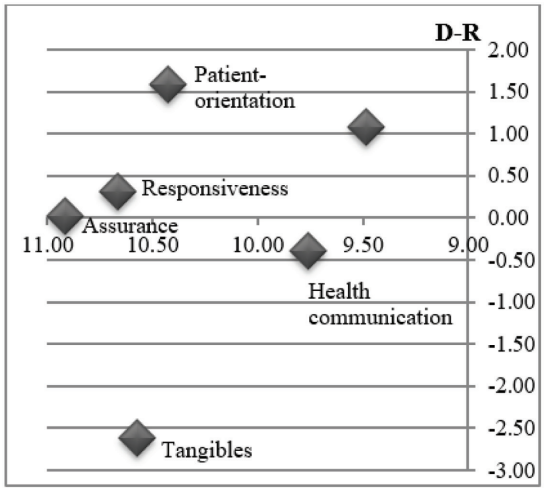

Figure 2 A Causal Graph Related to Service Quality Dimensions of Hospital B

under the mentioned line were regarded as impressionable/receptive criteria.

Order of importance related to service quality dimensions in hospital B as shown in table 2 was as following: assurance (10.92), responsiveness (10.67), tangibility (10.57), patient centeredness (10.43), communication (9.76) and security (9.49).

In hospital B security, patient centeredness, responsiveness and assurance were revealed to be influential criteria; while tangibility and communication were receptive ones.

As shown in Table 3, the most influential criterion in hospital C was responsiveness while patient centeredness and communication had the least severity of impact. Among service quality dimensions' communication, responsiveness and tangibility had no influential effect on perceived quality of healthcare services and were regarded as receptive factors (Figure 3).

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Results of applying TOPSIS model in rating each hospital's quality aspects indicated that responsiveness was ranked in the first position while safety got the least priority in hospital A (Table 4).

Table 5 depicts that assurance has been rated as the most important criterion while security was regarded the least significant one in hospital B. Finally the most and the least important quality dimensions in hospital C were responsiveness and security respectively (Table 6).

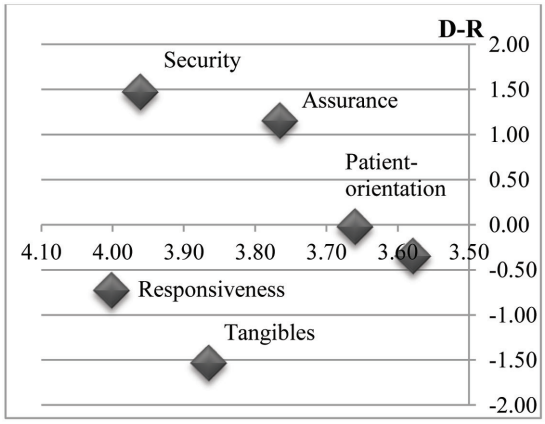

Figure 3 A Causal Graph Related to Service Quality Dimensions of Hospital C

Table 4 Assessment of Quality Aspects Ranking in Hospital A

Rank	Quality Dimensions	CL_i	Di-	Di+
1	Responsiveness	0.7418	0.0164	0.0057
2	Tangibility	0.179	0.0039	0.0177
3	Patient Orientation	0.6694	0.0152	0.0075
4	Assurance	0.723	0.0162	0.0062
5	Communication	0.4692	0.0107	0.0121
6	Security	0.6789	0.016	0.0076

Table 5 Assessment of Quality Aspects Ranking in Hospital B

Rank	Quality Dimensions	CL_i	Di-	Di+
1	Responsiveness	0.6211	0.0142	0.0087
2	Tangibility	0.3866	0.0088	0.014
3	Patient Orientation	0.6935	0.0152	0.0067
4	Assurance	0.6286	0.0149	0.0088
5	Communication	0.5526	0.0127	0.0103
6	Security	0.5058	0.0129	0.0126

Table 6 Assessment of Quality Aspects Ranking in Hospital C

Rank	Quality Dimensions	CL_i	Di-	Di+
1	Responsiveness	0.642	0.013	0.0073
2	Tangibility	0.3918	0.0086	0.0133
3	Patient Orientation	0.6406	0.0128	0.0072
4	Assurance	0.5715	0.0118	0.0089
5	Communication	0.457	0.0091	0.0108
6	Security	0.492	0.0109	0.0113

DISCUSSION

Through literature review six quality dimensions including responsiveness, assurance, security, tangibility, communication and patient centeredness were identified as influencing aspects of health services' quality in under study hospitals.

Narang (2010) in his study identified personnel behavior, adequacy of resources, health services provision and accessibility to healthcare as affecting quality dimensions.[17] Vinagre (2008) also outlined reliability, assurance and tangibility in this regard.[18] Empathy, giving priority to patients' needs, appropriate patient-provider communication, staff professionalism and physical environment were quality aspects identified in Arasli study.[19]

Results obtained from DEMATEL technique emphasized on security as an influential factor on patients' perceived quality in all three hospitals, assurance in hospitals A and C, responsiveness and patient centeredness in hospital B and communication in hospital A. A sense of security can be interpreted as respecting patients' privacy and confidentiality. In this way, it can be ensured that patients receive secure services during their length of stay in hospital and feel satisfaction from respectful behavior of staff. In hospital B, assurance and communication as well as security were introduced as effective quality aspects. In fact health providers can only guarantee the quality of services once a sense of confidence is induced to the care recipients. Also appropriate patient-provider communication is a significant issue in a healthcare industry as it facilitates the identification of patients' needs in reality. In hospital C two aspects of patient centeredness and responsiveness were given a special attention; while they mainly focus on care recipient as an influential factor on service quality which necessitates giving special attention to this group of customers' needs more than before. In a similar study conducted with a purpose of identifying key factors on hospital services quality, medical staff professionalism and appropriate communication were emphasized as the most influential aspects. Therefore training communication skills was proposed as a way to improve patients' trust toward providers.[20,21] In another research conducted by Wang et al, quality in diagnosis and treatment achieved through staff professionalism were regarded as the most important quality dimension.[22] Similarly, Jin et al mentioned medical staff competency, patients' complaint management

and a detailed investigation of patients' condition as affecting quality dimensions.[23]

Then using a self-reported questionnaire and TOPSIS model, six quality aspects were rated. In hospitals A and C, responsiveness and security got the highest and lowest importance respectively which emphasized on the need to provide healthcare services based on patients' needs. In hospital B the highest priority was given to assurance while the lowest emphasize was on security. Such a result suggested that health providers could successfully make a trustful relationship with patients. In a similar study factors including supportive environment, cleanliness, proper equipment, staff professionalism and competency were mentioned as influencing aspects.[23] Karydis et al. put a great emphasize on empathy and assurance.[24] while Adrienne and Emma (2002), Lim and Tang (2000), Mik and Hazel (2005) gave the highest priority to assurance.[25]

Study findings revealed that all three hospitals mentioned security as an influencing aspect of quality; emphasizing on the importance of improving such a criterion in healthcare institutions through proper planning. Although experts' opinion agreed with the importance of security in all under study hospitals but little attention was given to the issue in a planning process. In such a situation, patients might resist toward treatment interventions provided by medical staff and ultimately lead to an undesirable clinical outcomes.

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