Chapter 6

PATIENT'S UTILITY FOR HEALTHCARE ATTRIBUTES

This chapter of the thesis deals with the analysis of the relative importance of hospital attributes for patients. The study used focus group discussion for identification of important attributes of the hospital. The study further uses Conjoint Analysis for calculating the relative importance of the hospital attributes.

6.1 Methodology

This section of the paper discusses the study perspective, the rationale behind the selection of research method and details of the conjoint analysis.

The literature suggests defining the study perspective, including any relevant decision-making or policy context in the conjoint study. Bridges et al. (2011) observe that it is a good research- practice to offer the most accurate study perspective possible, the more specific the perspective, the more difficult it may be to find respondents. The aim of this study is to discuss the attributes affecting the choice of a diabetes clinic in the Indian context. The policymakers should put more emphasis on the attributes having higher utility for the patients and remove the redundant attributes to minimize the cost. The minimization of the cost will positively affect the medication adherence and hence will help us check the progression of diabetes to the more advanced stage.

A focus group consisting of two healthcare social worker, two doctors, two patients and a healthcare researcher (moderator) was created to find out the attributes and their level. It is

difficult to determine the ideal size of the focus group for a study. The factors used for the determination of focus group size, are the number of questions asked, the allotted time for each question, the format of the focus group session and the duration of the session (Tang and Davis, 1995). The studies recommend a size of six to eight to be used for the focus group for effective conduction of the exercise. Moreover, the unmoderated groups are generally less productive (Johnson, 1974).

Three meetings of the focus group were conducted during April 2017 to August 2017. The participants were asked to give the name of most important attributes in the selection of a diabetes clinic. The top five attributes and the level finalized for the selection of a diabetes clinic were quality of the hospital (high, medium, low) spend per visit (less than 500 Rupees, between 500 and 1000 Rupees, more than 1000 Rupees), hospitalization expense (less than 1000 Rupees/day, between 1000 and 3000 Rupees/day, more than 3000 Rupees/day), waiting time (less than 15 minutes, between 15 minutes and 30 minutes, more than 30 minutes) and distance to the hospital (less than 1 kilo-meter, between 1 to 3 Kilo-meter, more than 3 kilo-meter).

Kurk et al. (2017) in their paper observe that there is a need for governments to both improve health-care quality and to be able to measure the effects of such improvements. The term quality in this study is taken as the quality of the care provided by the doctor, nurses and hospital staffs. It is assumed that doctors and allied healthcare professionals with higher education level will provide better healthcare. The attribute “hospital quality” in this research is used for the combination of various criteria important for the performance of a hospital. It is a measure of the gap between perceived service level and expected service level by the patients. A healthcare provider is required to meet or exceed the expectation to be labeled as

a good quality provider. The Figure-6.1 below represent the construct "Patient's Utility", factors affecting it and its behavioral outcome.

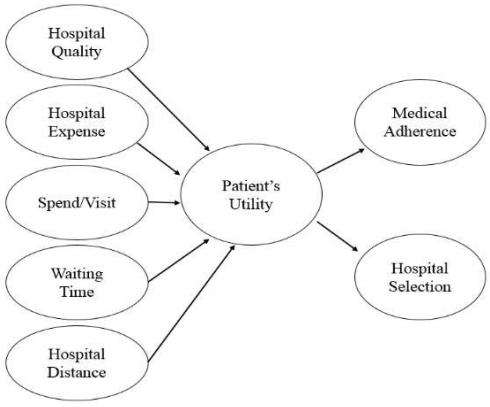

Figure 6. 1: Factors Affecting the Patients Utility for Hospital Services

6.1.1 Conjoint Analysis

The origin of the Conjoint Analysis can be viewed in an essay written by the psychologist, Luce and the statistician, Tukey half century ago (Green and Srinivasan 1978; Carroll and Green 1995). Since its introduction to marketing literature by Green and Rao (1971) as well as by Johnson (1974), the method has attracted the attention of theoreticians and practitioners.

Conjoint analysis (CA) is marketers' favorite methodology for finding out how buyers make trade-offs among competing products and suppliers. Thousands of applications of conjoint analysis have been carried out over the past four decades (Green et al, 2001).Conjoint analysis is a widely used method for determining how much certain attributes matter to consumers by observing a series of their choices (Aribarg et al, 2017).

In CA researchers seek the answer to the research question: To what extent does each attribute (factor) contribute to the total utility of a product? The attributes constituting the values of the product/service under study are classified into several levels. These factors

should be relevant, independent, realizable, and terminable. The various combinations of the factor values yield fictive products/services (cards) that are to be ranked by the interviewed persons. The number of these fictive options should be kept less than twenty otherwise it becomes difficult to rank the cards. The CA uses this ranking result to derive partial utilities. The sum of these partial utilities gives total utilities for the attributes (Malhotra, 2007).

This additive model of the conjoint analysis is defined as follows:

$$U'(X) = \sum_{i=1}^{m} \sum_{j=1}^{k_i} \alpha_{ij} * x_{ij} \quad (6.1)$$

Where,

U'(X) = overall utility of an alternative

α_{ij} = the part-worth contribution or utility associated with the *j*th level (*j*=1, 2… k_j) of the *i*th attribute (*i*=1, 2… *m*)

k_i = number of levels of attribute *i*

m= number of attributes

$$x_{ij} = \begin{cases} 1, if\ the\ jth\ level\ of\ ith\ attribute\ is\ present \\ 0\ , otherwise \end{cases}$$

The importance of an attribute, I_i is defined in terms of the range of the part-worth, α_{ij} across the levels of that attribute, W_i:

$$I_i = \{Max(\alpha_{ij}) - \min(\alpha_{ij})\}, for\ each\ i\ (attribute) \quad (6.2)$$

The attribute's importance is normalized to determine its importance relative to other attributes as below:

$$W'_i = \frac{I_i}{\sum_{i=1}^{m} I_j} * 100 \quad (6.3)$$

So that,

$$\sum_{i=1}^{m} W'_i = 100 \quad (6.4)$$

The procedure used for estimating the basic model is ordinary least-square (OLS) regression with dummy variables. The dependent variable in the model is preference rating while the independent variable is *n* number of the dummy variable. Where *n* is the total number of level for all *m* attributes.

To assess the reliability and validity of the conjoint analysis result, following methods were used:

1. Test-retest reliability was used to assess the reliability of the judgment. Test-retest reliability is the degree to which ranking scores are consistent over time. It indicates score variation that occurs from first time to second time as a result of errors of measurement. Three respondents were randomly selected from the respondents and asked to evaluate cards again after few days. The value of the rank data was correlated to assess the reliability. The null hypothesis used for the study is:

   $$H_0 = \textit{There is no significance difference between the two ranking}$$

   The confidence interval used for the study is taken as 95%.

   To test the hypothesis Spearman Rank Correlation coefficient was calculated. The Spearman Rank Correlation (ρ) is as a nonparametric measure of rank correlation (statistical dependence between the ranking of two variables) given by the following equation:

$$\rho = 1 - \frac{\sum_{i=1}^{n} d_i^2}{n^3 - n} \quad (6.5)$$

d_i =Difference between the two ranks of each observation

The p-value of the correlation was calculated using t-statistics as below:

$$t = \rho\sqrt{\frac{n-2}{1-\rho^2}} \quad (6.6)$$

The degree of the freedom $df = n - 2$

2. The Pearson R and Kendall's Tau correlation coefficients were used as a measure for the quality of reproduction of the empirical data by the result of the conjoint analysis. The SPSS output for the conjoint analysis was used for Pearson R and Kendall's Tau correlation coefficients.

The methodology used in the study is summarized in the Figure -6.2 below:

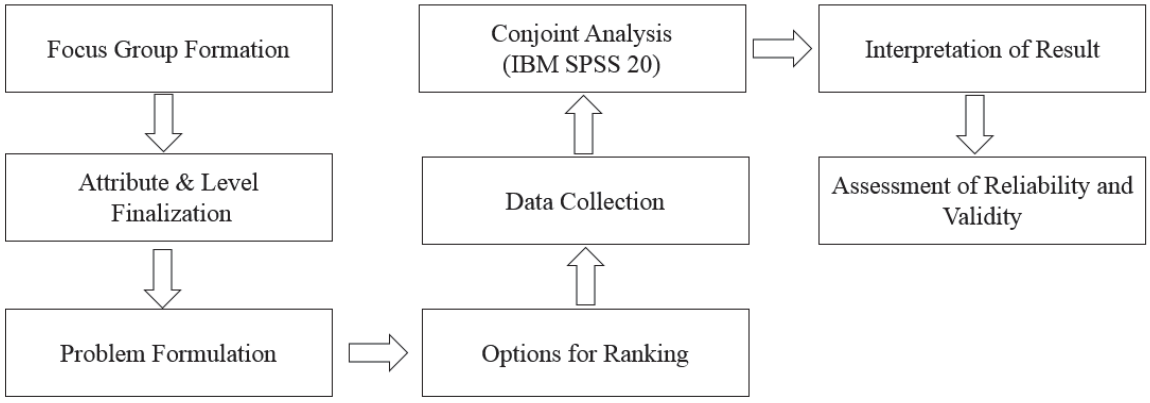

Figure 6. 2: Methodology Used for the Study

Since each of the five finalized attribute has 3 levels, the number of cards required to accommodate all combinations becomes 243. The study uses orthogonal design table to reduce the number to 16 cards (Table –6.1).

6.1.2 Sample Size

Sample size calculation in case of a conjoint analysis is a difficult exercise. The sample size depends on many factors including complexity of the options, the desired accuracy of the results, the availability of respondents, and the need to conduct subgroup analysis (Louviere et al., 2000).

Marshall et al. (2010) reported that the mean sample size for conjoint-analysis studies in health care published between 2005 and 2008 was 259, with nearly 40% of the sample sizes in the range of 100 to 300 respondents. The literature suggests the minimum sample size for the conjoint analysis as 300 with a minimum of 200 respondents per group for subgroup analysis (Orme, 2006).

A total 400 patients, patient's relative and healthcare professionals from two diabetes specialty clinic from Varanasi were requested to rank the choices presented in front of them. Out of 400 patients, 301 responded with the completed response. The data was collected from the out-patient-department (OPD) of the two privately owned diabetes clinics over the duration of three months. The respondents were requested to rank the cards from 1 (most preferable) to 16 (least preferable).

Preparation of the orthogonal design table and conjoint analysis were performed using SPSS 20.0.

6.2 Results and Discussions

Of the 400 subjects to whom the questionnaire was distributed, a response was obtained from 325 subjects out of which 301 responses were complete (75.25 percent). The inclusion

criteria for the respondent of the study was age greater than 35 years & less than seventy years and suffering from diabetes. The descriptive characteristics of the respondents are summarized in Table 6.2.

Table 6. 1: 16 Cards for the Conjoint Experiment

Card ID	QUALITY	HOSPITAL_EXP	SPEND_PV	WAITING	DISTANCE
1	High	X≤1000 Rs	500<X≤1000 Rs	X>30 Min	X≤1 Km
2	Low	1000<X≤3000 Rs	X>1000 Rs	X≤15 Min	X≤1 Km
3	Low	X≤1000 Rs	X≤500 Rs	X≤15 Min	X≤1 Km
4	Low	1000<X≤3000 Rs	X<500 Rs	X>30 Min	>3Km
5	Low	X>3000 Rs	500<X≤1000 Rs	X≤15 Min	X≤1 Km
6	Low	X≤1000 Rs	X≤500 Rs	X≤15 Min	X≤1 Km
7	Medium	X≤1000 Rs	X>1000 Rs	X>30 Min	X≤1 Km
8	Low	X≤1000 Rs	500<X≤1000 Rs	15 <X≤30 Min	>3Km
9	High	X>3000 Rs	X>1000 Rs	X≤15 Min	>3Km
10	High	1000<X≤3000 Rs	X≤500 Rs	15 <X≤30 Min	X≤1 Km
11	Medium	X>3000 Rs	X≤500 Rs	15 <X≤30 Min	X≤1 Km
12	High	X≤1000 Rs	X≤500 Rs	X≤15 Min	1<X≤3 Km
13	Medium	1000<X≤3000 Rs	500<X≤1000 Rs	X≤15 Min	1<X≤3 Km
14	Medium	X≤1000 Rs	X≤500 Rs	X≤15 Min	>3Km
15	Low	X≤1000 Rs	X>1000 Rs	15 <X≤30 Min	1<X≤3 Km
16	Low	X>3000 Rs	X≤500 Rs	X>30 Min	1<X≤3 Km

Table 6. 2: Respondents Characteristics

Description	Respondents	Percentage
Age		
35 -45	55	18.27%
46-55	197	35.56%
>55	149	42.22%
Gender		
Male	202	67.11%
Female	99	32.89%
Occupation		
Healthcare profession	14	4.65 %
Others profession	287	95.35%
Experience of Visiting Diabetes Clinic		
First-time visitor	67	22.26%
Visit Frequently	189	62.79%
Never Visited	45	14.95%

The Table –6.3 lists the utilities for the different attributes and levels. The utility for a card/option can be calculated using a weighted sum of the utilities of the corresponding attribute.

The utility value for a card can be calculated using the equation -7, as below. The coefficient used in the equation is listed in Table 6.4.

$$U(Card) = U_0 + B_1 * U_{Hospital\_Exp} + B_2 * U_{Spend\_PV} + B_3 * U_{Waiting} + B_4 * U_{Distance} \quad (7)$$

Table 6. 3: Utilities for Different Attributes and Levels

		Utility Estimate	Std. Error
QUALITY	Low	-3.218	.737
	Medium	1.546	.864
	High	1.672	.864
HOSPITAL_EXP	X<1000 Rs	-.826	.666
	1000<X<3000 Rs	-1.653	1.333
	X>3000 Rs	-2.479	1.999
SPEND_PV	X<500 Rs	-.671	.666
	500<X<1000 Rs	-1.343	1.333
	X>1000 Rs	-2.014	1.999
WAITING	X<15 Min	-1.084	.666
	15 <X<30 Min	-2.169	1.333
	X>30 Min	-3.253	1.999
DISTANCE	X<1 Km	.026	.666
	1<X<3 Km	.051	1.333
	>3Km	.077	1.999
(Constant)		13.778	2.404

Table 6. 4: B Coefficients for the Model

	Coefficient	Estimate
HOSPITAL_EXP	B_1	-.826
SPEND_PV	B_2	-.671
WAITING	B_3	-1.084
DISTANCE	B_4	.026

The average importance score for the attributes can be calculated using the equation 2- 3 (Table 6.5). The value of the importance score is normalized so that the sum of average importance score is 100.

Table 6. 5: Average Importance Score of Attributes

QUALITY	56.520
HOSPITAL_EXP	12.832
SPEND_PV	10.043
WAITING	17.796
DISTANCE	2.764

The results show that the Quality of hospital is the most important criteria for the selection of a hospital while the waiting time is second most important criteria for the selection. The patients frequently need to visit a clinic in case of a chronic disease like diabetes hence hospitalization expense and spend per visit become important in the calculation of the economic burden of the disease. The spend per visit includes doctor's consultancy fee, diet counseling fee, spend on investigations and cost of medicine whereas hospitalization expense includes the bed-charge, monitors charge, oxygen charge, nursing charge etc.

The Figure -6.3 below depicts the utilities for different levels of hospital quality. The higher the quality higher preferred the healthcare option becomes.

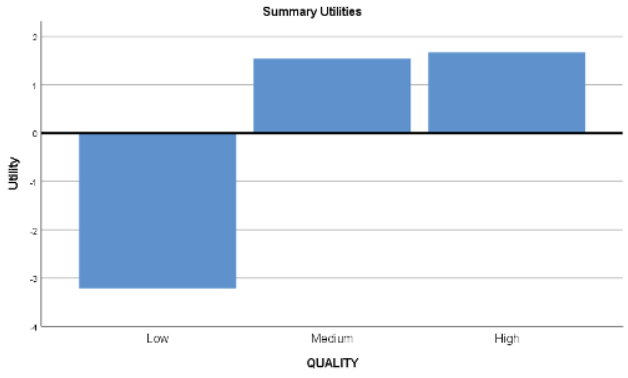

Figure 6. 3: Summary of Utilities for the Hospital Quality

The Figure -6.4 below depicts the utilities for different levels of hospital expenses. The higher the hospital expense lesser preferred the healthcare option becomes.

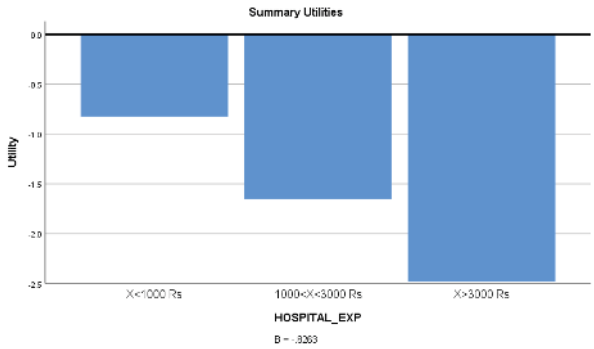

Figure 6. 4: Summary of Utilities for the Hospitalization Expenses

The Figure -6.5 below depicts the utilities for different levels of spend per visit (other than hospitalization). The higher the spend per visit lesser preferred the healthcare option becomes.

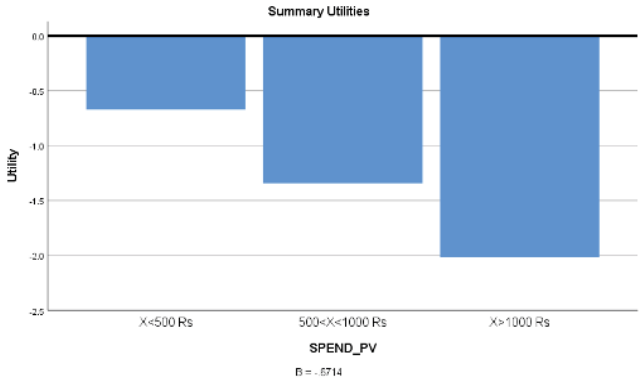

Figure 6. 5: Summary of Utilities for the Spend per Visit

Similarly, The Figure -6.6 depicts the utilities for different levels of the waiting time. The higher the waiting time to avail the service lesser preferred the healthcare option becomes.

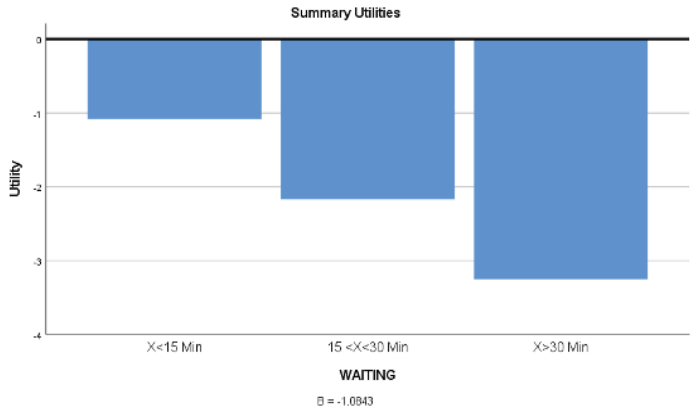

Figure 6. 6: Summary of Utilities for the Waiting Time

The Figure 6.7 below depicts the average importance score of the attributes calculated using statistical software SPSS 20. As visible in the figure hospital quality is most important criteria in the selection of the diabetes clinic.

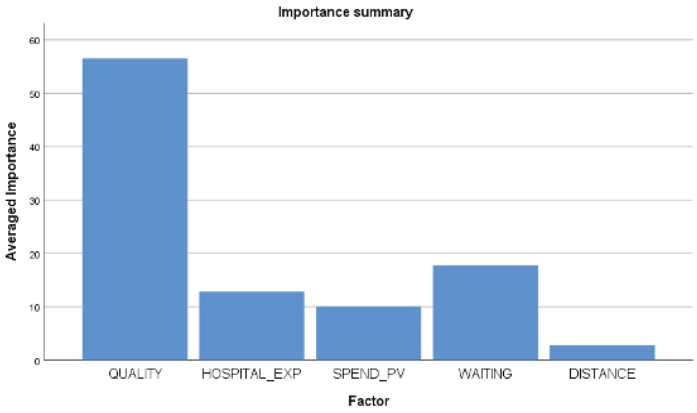

Figure 6. 7: Average Importance Score for Different Attribute

The waiting time is another important criterion for the selection of the diabetes clinic. The patients visiting a private clinic are more demanding and expect the waiting time to be minimized. The waiting time is one of the critical factors in the selection of the private clinic over public hospitals. Since the respondents of the study are engaged from out-patient-department of the private diabetes specialty clinic, this may be a probable reason behind the

high importance of this factor. The hospital expense and spend per visit are other important criteria for the selection of a diabetes clinic. The results of this study suggest that distance is least important among criteria for the selection of a diabetes clinic. The probable reason behind this result may be the minor difference between the levels of the distance attributes. Increasing the difference in the levels may give higher importance value for this attribute.

Test-Retest Reliability

Three respondents were randomly selected from the three hundred one respondents who have completely filled the questionnaire. They were contacted and requested to provide their raking of the cards again. The test-retest reliability was performed on the responses were collected from this exercise (Table 6.6).

Table 6. 6: Correlation Table for Reliability Testing

	Respondent 1	Respondent 2	Respondent 3
Pearson Correlation Coefficient	0.996	0.998	0.970
t-statistics	41.71	59.07	14.93
Significance Value $\alpha = 0.05$, (Two Tailed Test)	P-value <.00001.	P-value <.00001.	P-value <.00001

The high correlation coefficient indicates that there is consistency in the response of the respondents. The value of the correlation was found significant at 95 % confidence interval. The Pearson's R and Kendall's tau value were calculated to find the correlation between observed and estimated preferences for conjoint analysis. The Pearson's R and Kendall's tau value for the study were found 0.577 and 0.427 respectively. The correlation between observed and estimated preference was found significant at confidence level 95% (Table 6.7).

Table 6. 7: Correlations between observed and estimated preferences

	Value	Sig.
Pearson's R	.854	.001
Kendall's tau	.728	.001

6.3 Conclusion

The study concludes that the quality of a hospital is an important criterion in the selection of a hospital even in an economically backward region like Varanasi. The importance this factor is almost three times higher as compared to the second important criteria, waiting time. This result concurs with the finding of the earlier studies done in other countries (Choi et al.,2004, Bochus et al.,2005).The waiting time is second important criteria in the selection of a diabetes clinic while the hospital distance is least important criteria for the selection of a diabetes clinic.

The chronic nature of diabetes requires a frequent visit to the hospital. Every visit is associated with cost, which includes spending on travel, doctor's consultation, diet consultation, diabetes education, pathology investigation and medicine cost. This recurring spends makes "spend per visit" as one of the important criteria in diabetes clinic selection. The hospitalization is less frequent at the initial stage of diabetes but may become an important criterion for hospital selection as the disease advances. The study performed on patients at an advanced stage of diabetes may give hospitalization expense even higher importance.

6.4 Managerial Implications

The quality is most important criteria for the selection of a diabetes clinic. The hospital employing better-qualified healthcare professionals will be preferred over others if everything else is kept constant. The waiting time is second most important criteria for selection of a private diabetes clinic and organization should strive to minimize the waiting time in their service operations.

The management can also apply for the accreditation of National Accreditation Board for Hospitals & Healthcare Providers (NABH).It is a constituent board of Quality Council of India, set up to establish and operate accreditation programme for healthcare organisations. This Accreditation results in high quality of care and patient safety. Since the quality is one of the most important criteria of selection of the accreditation also gives a hospital competitive advantage.

6.5 Limitation of the Research

The sampling method used is the judgmental non-random sampling and may not represent the actual diabetes population. The finding of the study can only be generalized to the patients having similar demographic criteria, having age between 35 and 70 years of age and suffering from diabetes. The cost of care (spend per visit and hospitalization expense) becomes a critical factor as the disease progresses in case of diabetes and hospital should offer different options of bed charges like private room ,semi-private room and general wards so that high hospitalization charge doesn't deprive a poor patient of availing the services of the hospital.

6.6 Future Directions

Since the quality and performance of a hospital is most important criteria in the selection of a diabetes clinic, there is a need for further investigation about the determinant of quality of a diabetes clinic. A customized framework to assess the quality of a diabetes clinic should be developed. This next chapter of the study discusses the Quality Assessment and Implementation Framework for a diabetes clinic.