

# Application of Analytical Hierarchy Process in Deduction on the Relative Importance and the Priority of Dental Hospital

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## Abstract

**Objectives:** In this study, based on research on patient satisfaction of existing dental care services, to create a hierarchical structure to gradually less critical lower level of problem from the top level (target), relative of each element in the hierarchy using pair wise comparison matrix, AHP (Analytic Hierarchy Process) method to determine the importance. **Methods/Statistical Analysis:** This study used modified questionnaires in Kim's study to complement for purpose of the present study. It was selected as 4 major factors; Convenience of using procedures, facility and the environment, image of medical staff, image of employee owing to be adapted to study. Then, it was selected to the 16 types in subscales. **Findings:** 'Reliability of doctor', 'Sanitary condition', 'Newest dental equipment', 'Communication skill'. So that, Male's most importance factor of select dental hospital is 'Reliability of doctor' which means the doctor can give faith to listen well the patient's story or doctor's well-known experience or educational status. And then it places a great importance on 'Specialty of treatment', 'Sanitary condition'. In female group, it showed that 'Accessibility', 'Appropriacy of treatment bill', 'Communication skill', 'Specialty of treatment', 'Reliability of doctor' are distinct from male group, In female group rates 'Accessibility' factor high, in sequence Appropriacy of treatment bill'. On the other hand, they rates 'Decent appearance of staff' and 'Interior', 'Parking facilities' factors relatively low. **Improvements/Applications:** It was possible to know that 'Reliability of doctor' on part of 'Image of medical staff', 'Specialty of treatment', 'Communication skill', 'Accessibility' were important factors to improve the competitiveness of dental hospital and it is considered to be ongoing effort to be able to provide an environment that can improve the patient satisfaction enhancing management improvement and competitiveness of hospitals, improve the quality of care in gradually intensified competition on medical market.

**Keywords:** AHP, Awareness, Dental Hospital, Image, Relative Importance

## 1. Introduction

Recently, Medical Community in Korea have a change that high quality of medical services and opening medical market in the paradigm in accordance with the improvement

of the quality of people's life quality<sup>1,2</sup>. Under Korea's health care policy, patients have freedom to select customized hospital by their characteristics. For this reason, competition is being intensified among hospitals<sup>3,4</sup>. In other words, medical consumers had increased interest in their own

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health and medical knowledge so select capacity of medical institutions were formed as a result converting from a hospital-centered in the patient-centered way of thinking made to seek a high level of medical services<sup>5</sup>. Due to this, the tendency that providing patient care services may move around in the form of patient-centered or consumer-centered way was observed<sup>6</sup>.

According to<sup>7</sup> study related to the hospital of the satisfaction, technology, awareness, treatment costs adequacy, care provider's affective behavior, good practice environment affect the patient's satisfaction. In this study, the result of analysis of the factors affecting the patient's satisfaction classified by visiting purpose. All patients think that it was important to have dental technology, awareness in common. In case of aesthetic purposes, doctor's kindness and the cost of treatment were considered important factors. And in case of therapeutic purposes, practice environment acted as an important factor<sup>7</sup>. According to Song's study, the major factors which explain the recognition of hospital and trustworthiness of treatment were kindness and cost factors<sup>8</sup>, a research conducted by Yoon et al., the subjects choose their dental clinic firstly because of the doctors' high level of medical techniques and secondly because of their kind medical services<sup>9,10</sup>. In this way, there is a growth in the number of studies on hospital satisfaction of a dental patient. In this study, based on research on patient satisfaction of existing dental care services, to create a hierarchical structure to gradually less critical lower level of problem from the top level (target), relative of each element in the hierarchy using pair wise comparison matrix, AHP (Analytic Hierarchy Process) method to determine the importance<sup>11</sup>.

Unlike other statistical method, with the AHP designed by Satty is possible to know whether the alternative poll priority through the comparison of the opponent are relatively how many priority. Also, it has the advantage that it is possible to calculate the evaluated scientific methods in small number of respondents<sup>3</sup>. Therefore, it is the most appropriate analytical methods to understand the relative importance and priorities of us, would choose a dental hospital seen in this study.

The purpose of setting the model of the present study was divided into three layers increases the important factors of the selection of the dental clinic. The first layer composed of the two elements, the second layer, four elements, the third layer, 16 elements. Figure 1 presents a priority derived AHP model to the relative importance of selection factors Dental Hospital.

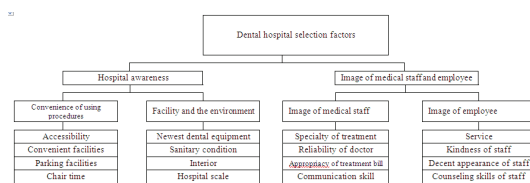
Therefore, in this study, some of the factors that affect the use and selection of the dental office were examined with a random sampling for the entire Sun Moon University on the basis of research on patient satisfaction with conventional dental services in it.

Further, when the dental selection, by applying or AHP relatively important factor is what the patients were analyzed and priorities relative proportions of consideration evaluation factors preferentially when selecting a dental clinic. The results obtained through these studies, aims to present a strategic suggestion of hospital management which can contribute to the operation of the future dental hospital.

## 2. Subjects and Methods

### 2.1 Subjects

From May 4<sup>th</sup> 2015 to June 12<sup>th</sup> 2015, after explaining the aim of this study to student in S university located Chungcheong-do in Korea, the student who consent to the collection data was investigated AHP questionnaire by self-reported type. In total 100 responses, 95 people of questionnaire responses were used in final analysis except for the 5 poor responses. This study used modified questionnaires in<sup>6</sup> to complement for the purpose of the present study. It was selected as 4 major factors; Convenience of using procedures, facility and the environment, image of medical staff, image of employee owing to be adapted to study. Then, It was selected to the 16 types in subscales. (Figure1)



**Figure 1.** Major Factors of Select Dental Hospital (Hierarchy Tree).

### 2.2 Statistical Analysis

Sociodemographic analysis were carried out using SPSS Win 12.0 program. It analyzed through the program using the Excel to fit AHP analysis and pair-wise comparison of selected properties was used to 9 scales method.

### 3. Results

#### 3.1 General Characteristics of the Subjects

Sociodemographic distribution, in gender, was reported as 46 men (48.4%) and 49 women (51.6%) and in age, It showed twenties mostly accounting for 67 peoples (70.5%) (Table 1).

**Table 1.** Sociodemographic Characteristics of Subjects

Variables		Number	Proportion(%)
Sex	Male	46	48.4
	Female	49	51.6
Age	10S	23	24.2
	20S	67	70.5
	30S	2	2.1
	40S	2	2.1
	50S	0	0.0
	over 60s	1	1.1
Occupation	Student	86	90.5
	The professions	2	2.1
	Own business	2	2.1
	Businessman	2	2.1
	Etc	3	3.2

#### 3.2 Relative Importance of Dental Hospital Selection

AHP model of dental hospital selection factors was presented in Figure 1, the result of pair-wise comparing on 2 factors showed that 'Image of staff and employee' (0.5648) were more important factor than 'Hospital awareness' (0.4352) in the first layer.

The result of subanalysis of 'Hospital awareness' in the second layer showed that 'Convenient of using procedures' (0.5011) was more important than 'Facility and the environment' (0.4989), and that of 'Image of medical staff and employee' showed that 'Image of medical staff' (0.7164) was more important than 'Image of employee' (0.2836).

In subscale in the factors, It was showed to 'Accessibility' (0.4106), 'Chair time' (0.3232), 'Convenient facility' (0.1717), 'Parking facility' (0.0945) on 'Convenience of using procedures' factor, and 'Sanitary condition' (0.4607), 'Newest dental equipment' (0.3402), 'Hospital scale' (0.1142), 'Interior' (0.0950) on 'Facility and environment'

factor. On 'Image of medical staff' factor, It was showed 'Reliability of doctor' (0.2860), 'Specialty of treatment' (0.2770), 'Communication skill' (0.2236), 'Appropriacy of treatment bill' (0.2134) and On 'Image of employee' factor, It was showed 'Kindness of staff' (0.3839), 'Counseling skill of staff' (0.2963), 'Service' (0.2265), 'Decent appearance of staff' (0.0933)(Table 2).

#### 3.3 Comparison of Priority of Dental Hospital Selection by Gender

'Reliability of doctor' (0.1328), 'Sanitary condition' (0.1148), 'Newest dental equipment' (0.0897), 'Communication skill' (0.0745). So that, Male's most importance factor in selecting dental hospital is 'Reliability of doctor' which means the doctor can give faith to listen well the patient's story or doctor's well-known experience or educational status. And then it places a great importance on 'Specialty of treatment', 'Sanitary condition'.

In female group, it showed that 'Accessibility' (0.1102), 'Appropriacy of treatment bill' (0.1058), 'Communication skill' (0.1058), 'Specialty of treatment' (0.1039), 'Reliability of doctor' (0.0992). As distinct from male group, In female group rates 'Accessibility' factor high, in sequence 'Appropriacy of treatment bill'. On the other hand, they rate 'Decent appearance of staff' and 'Interior', 'Parking facilities' factors relatively low as shown in Table 3.

### 4. Summary and Conclusion

This study is carried out to suggest the strategic implications of hospital management which can contribute to the operation of dental hospitals, by investigating to derive an important factor to know the relative proportions and priorities to take into account evaluation factor preferentially based on the 'Study on patient satisfaction regarding on dental care service'.

Subjects of this research consisted of 46 males (49.4%), 49 females (51.6%) and distribution of age showed 67 the twenties (70.5%), 23 the teens (24.2%).

AHP model was proposed to investigate relative importance of dental hospital selection, Through this analysis, it was showed that 'Image of medical staff and employee' had 0.5648 weight of importance and 'Hospital awareness' had 0.4352 in 1<sup>st</sup> layer factors. In<sup>6</sup> and<sup>12</sup> study also results that 'Image of dental staff and employee' was relatively more important to select dental hospital. In 2<sup>nd</sup> layer 'Hospital awareness', by<sup>13</sup> resulted the proximity to

**Table 2.** Relative Importance of Dental Hospital Selection (\*CR<0.1)

1 <sup>st</sup> layer	CI/CR	2 <sup>nd</sup> layer	CI/CR	3 <sup>rd</sup> layer	CI/CR	CR
Hospital Awareness	0.4352	Convenience of using procedures	0.5011	Accessibility	0.4106	0.0076*
				Convenient facilities	0.1717	
				Parking facilities	0.0945	
				Chair time	0.3232	
		Facility and the environment	0.4989	Newest dental equipment	0.3402	0.0019*
				Sanitary condition	0.4607	
				Interior	0.0950	
				Hospital scale	0.1142	
Image of medical staff and employee	0.5648	Image of medical staff	0.7164	Specialty of treatment	0.2770	0.0227*
				Reliability of doctor	0.2860	
				Appropriacy of treatment bill	0.2134	
				Communication skill	0.2236	
		Image of employee	0.2836	Service	0.2265	0.0041*
				Kindness of staff	0.3839	
				Decent appearance of staff	0.0933	
				Counselling skills of staff	0.2963	

**Table 3.** Comparison of Priority of Dental Hospital Selection by Gender (\*CR<0.1)

1 <sup>st</sup> layer	2 <sup>nd</sup> layer	3 <sup>rd</sup> layer	CI/CR		Order priority		CR	
			Male	Female	Male	Female	Male	Female
Hospital Awareness	Convenience of using procedures	Accessibility	0.3819	0.4372	6	1	0.0009*	0.0248*
		Convenient facilities	0.1738	0.1691	12	11		
		Parking facilities	0.1103	0.0815	15	14		
		Chair time	0.3340	0.3129	9	7		
	Facility and the environment	Newest dental equipment	0.3548	0.3267	4	8	0.0007*	0.0048*
		Sanitary condition	0.4540	0.4666	3	6		
		Interior	0.0821	0.0877	14	15		
		Hospital scale	0.1091	0.1190	13	13		
Image of medical staff and employee	Image of medical staff	Specialty of treatment	0.3007	0.2506	2	4	0.0242*	0.0208*
		Reliability of doctor	0.3376	0.2392	1	5		
		Appropriacy of treatment bill	0.1721	0.2552	7	2		
		Communication skill	0.1895	0.2551	5	3		
	Image of employee	Service	0.2382	0.2150	11	12	0.0046*	0.0052*
		Kindness of staff	0.3757	0.3899	8	9		
		Decent appearance of staff	0.1110	0.0789	16	16		
		Counseling skills of staff	0.2751	0.3161	10	10		

parking convenience and hospital became the same result as what was reported to have an effect on consumer choice. It was showed that importance of 'Convenience of using procedures' weighted 0.5011 is relatively more important than 'Facility and the environment' weighted 0.4989. In subscale (3<sup>rd</sup> layer) of 'Convenience of using procedures (2<sup>nd</sup> layer)', It was showed to 'Accessibility' weighted 0.4106, 'Chair time' weighted 0.3232, 'Convenient facility' weighted 0.1717 and 'Parking facility' weighted 0.0945. Likewise in subscale (3<sup>rd</sup> layer) of 'Facility and the environment (2<sup>nd</sup> layer)', 'Newest dental equipment' weighted 0.3402 and 'Sanitary condition' weighted 0.4607, 'Interior' weighted 0.0950, 'Hospital scale' weighted 0.1142. It was showed that 'Sanitary condition' was most important factor followed by 'Newest dental equipment', 'Hospital scale', 'Interior'.

In 2<sup>nd</sup> layer, It showed that importance of 'Image of medical staff' which weighted 0.7164 was relatively important factor of dental hospital selection as compared with 'Image of employee' weighted 0.2836. In subscale (3<sup>rd</sup> layer) of 'Image of medical staff (2<sup>nd</sup> layer)'. It was showed that 'Specialty of treatment' weighted 0.2770, 'Reliability of doctor' weighted 0.2860, 'Appropriacy of treatment bill' weighted 0.2134 and 'Communication skill' weighted 0.2236. Overall, there were no big difference among subscales but it was showed that 'Reliability of doctor' was relatively most important factor<sup>13-15</sup>. Also, in subscale (3<sup>rd</sup> layer) of 'Image of employee (2<sup>nd</sup> layer)', It was showed that 'Service' weighted 0.2265, 'Kindness of staff' weighted 0.3839, 'Decent appearance of staff' weighted 0.0933 and 'Counseling skill of staff' weighted 0.2963. it was showed that 'Kindness of staff' was relatively most important factor.

To compare relative importance and priority by gender, in male group's 'Image of medical staff (2<sup>nd</sup> layer)', it was showed that relative importance in sequence of 'Reliability of doctor (ranking 1<sup>st</sup>)', 'Specialty of treatment (2<sup>nd</sup>)', 'Sanitary condition (3<sup>rd</sup>)'. In female group's 'Convenience of using procedures (2<sup>nd</sup> layer)', it was showed that relatively most important to 'Accessibility (3<sup>rd</sup> layer)'. Followed by 'Appropriacy of treatment bill' and 'Communication skill (3<sup>rd</sup> layer)' in 'Image of medical staff (2<sup>nd</sup> layer)'. It is not an exact match of the elements of the hospital choice between male and female, however in general, 'Image of medical staff (2<sup>nd</sup> layer)' was evaluated by relatively important factors. On the other hand, In 'Image of employee (2<sup>nd</sup> layer)', 'Decent appearance of staff (3<sup>rd</sup> layer)' was lowest priority on factors, overall there was tendency which got lower on 'Descent

appearance of staff', 'Parking facilities', 'Interior' and 'Hospital scale'. In this way, 'Image of medical staff' had considered to have relatively high important for choosing dental hospital, while 'Decent appearance of staff', 'Descent appearance of staff', 'Parking facilities', 'Interior' and 'Hospital scale' had relatively low importance. However, this study was conducted in restricted places, and most of subjects' age was twenties. Also, it was studied on dental hospital. Therefore, it is hard to generalize these results and needs further investigation to overcome these weakness. In statistical view, it was not statistically different between 'Image of medical staff' had relatively high importance and 'Image of employee'. However in studies on patient's satisfaction in medical services by dental hygienist,<sup>16-18</sup> resulted that the better quality evaluation of medical services of dental hygienist, higher patient satisfaction, as a result, the role of dental hygienist to see that the re-use intention to increase has to be important. Even if the importance of the ranking is low, 'Image of employees' is considered to have an impact in the portion when looking at the long-term management of the dental hospital.

Based on the above results, it was possible to know that 'Reliability of doctor' on part of 'Image of medical staff', 'Specialty of treatment', 'Communication skill' and 'Accessibility' were important factors to improve the competitiveness of dental hospital. It is considered to be an ongoing effort to be able to provide an environment that can improve the patient satisfaction enhancing management improvement and competitiveness of hospitals to improve the quality of care in gradually intensified competition of medical market.

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