

INVITED REVIEW ARTICLE

# The effective distribution system for the concentration of patients to extra-large hospitals

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**Purpose:** In Korean society, extra-large hospitals are congested with the majority of patients. Because of the congestions, the urgent patients need to wait anywhere from as short as a month to around three months. These concentrations of the patients on the extra-large hospitals causes not only the economic problem in terms of loss of opportunity cost and resources of other medium and large hospitals but also the fear and the consequential stress of the patients and the families of the patients who are waiting for the surgeries. The phenomenon of the concentrations derived due to the insufficient information to the medical consumers. If the information on medical treatment services such as surgery schedule is provided before the selection of hospital, we expect that the selection of hospital for the patients and their family will differ, resulting in redistribution of concentration phenomenon. In this paper, we propose and verify the effective distribution system for the concentration on the extra-large hospitals. **Methods:** Web simulation survey was conducted. A total 100 respondents were divided into 4 groups of 25 respondents and the different information was provided to each group. **Results:** Through multiple comparisons among groups, only group which was provided with both information about 'the difference of surgical results' and 'the waiting time for surgery', had difference in significance. **Conclusion:** By providing two sets of information to patients, reckless selection of extra-large hospitals can be spread to more appropriate hospitals and therefore achieve effective distribution of the population concentration on extra-large hospital.

**Key Words:** Hospital distribution systems, Patient self-determination act, Decision theory, Appointments and schedules

## INTRODUCTION

### Raising issues

In Korea, extra-large hospitals are congested and patients who need urgent surgery are forced to wait from one to three months to receive surgical treatments. In cases of cancer patients, this waiting period can cause distant metastasis through blood or lymphocytes. For effective

treatment, tumors need to be removed as soon as possible once a diagnosis is confirmed. Therefore, it's important for patients to consider surgery confirmation when selecting a hospital. However, hospitals don't provide information regarding surgery schedules which causes patients to make uninformed decisions on selecting a third medical institution (considering the initial diagnosis came from a first and/or second medical institution). In the preceding

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studies, Lee [1] concluded that the selection of a third general hospital for outpatients was based on the facilities, modernity of medical practice, the trust of the hospital, and accessibility to the hospital. Another study, conducted by Kim and Yu [2], showed that favorable impressions and attractiveness were the decision-making factors.

It is shown that patients tend to make choices based on non-objective information such as modernity and professional credibility, which causes the concentration of patients in certain extra-large hospitals. The phenomenon of this concentration in extra-large hospitals causes economic problems (i.e., wasting resources and the loss of opportunity costs for other medium and large hospitals), fear, and the consequential stress on patients and their families while they wait for the operations reported by Shin et al. [3], all of which can result in grave social issues.

According to Leske [4], surgery is the most disturbing situation for patients and families, as they have a tendency to experience more complex fears and stresses. Carmody et al. [5] reported that the waiting period for surgeries caused the most intense fears to develop among patients' families. Donnell [6] mentioned that during surgeries to remove cancerous tumors, patients' families become the most anxious and desperate by imagining the worst outcomes such as unexpected surgery results or the doctor's inability to conduct the surgery.

The fears being referred to in the previous studies are based on patients who have been admitted to a hospital, but are yet to undergo surgery. Their anxieties vary from those that typically arise during the waiting periods before a surgery takes place. We want to reduce these anxieties by redirecting the population concentrations between extra-large hospitals as effectively as possible. Because the longer the patients wait before undergoing surgery, the more aggravated they and their families become.

In conclusion, the concentration of patients in extra-large hospitals is caused by poor selection due to a lack of information available to the medical consumers. This should be alleviated through the development of an effective distribution system that would decrease the waste of economic resources and anxieties among medical consumers.

### Purpose of research

We intend to conduct this study by focusing on treatment services (greater emphasis on surgeries) that are provided by extra-large medical institutions. The previously discussed factors that affect consumers' hospital selection (i.e., medical facilities, accessibility, features and appearance of facilities, professional credibility) are the direct cause of population concentration in extra-large hospitals. In a study conducted by Mulgan and Logan [7] and Sung [8], the lack of understanding and communication between medical teams and the patients were primary causes of patients' anxiety during the waiting period prior to surgery. Reducing the uncertainty and clarifying the above issues will also reduce patients' and their families' fears. It is clear that the promotion of sufficient information on treatment services will reduce fears and will sufficiently influence the selection of hospital. Finding and verifying new variables can change the decision making of patients on hospital choice and therefore effectively follow through on our propose, an effective distribution system.

The purpose of this research can be summarized as follows.

- 1) try to find new variables that can influence hospital selection of patients that correspond with treatment services based on treatment and surgery.
- 2) measure the effectiveness of the found variables.
- 3) based on the effective variables, propose and verify an effective distribution system.

### Population concentration on extra-large hospitals and problems

#### *Understanding of the process of treatment for the patients*

Domestic medical institutions are classified into the 1st, 2nd and 3rd institution categories. There are many subjects, such as number of beds and departments that will determine the class of hospitals. In order to prevent the concentration of patients on 3rd medical institutions, the government regulates patients going to 3rd medical institutions when they have received diagnosis and early stage treatment from 1st and 2nd medical institutions. Therefore, patients undergo the initial treatment and vari-

ous tests in 1st and 2nd medical institutions and then, if such institutions cannot cure the disease based on its severity, then they are transferred to 3rd medical institutions for advanced treatment or therapy. At this time in general, 3rd medical institutions that have cooperative relationships with or, where the medical attendants of the 1st and 2nd hospital conduct their internship, are recommended from the 1st and 2nd hospitals where the patients were initially treated.

When patients request admission to the recommended 3rd medical institution, they have to be re-diagnosed. If the treatment or the surgery is confirmed, then they are informed of the schedule of the surgery and must return home to await the surgery. The patients have the choice to go to other medical institutions rather than the recommended institutions. However, the selection by the patients for the 3rd medical institutions, at this time, will likely depend on whether the recommended 3rd medical institution is renowned in their name and size. If ex-

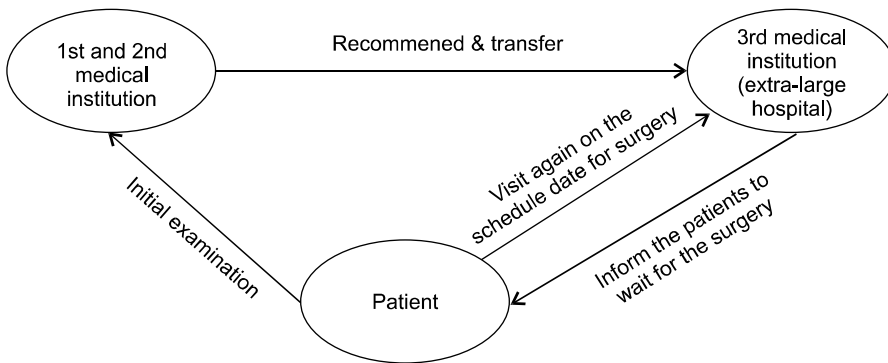
tra-large hospitals are recommended to patients, some will just wait for the scheduled surgery but others and their families may tend to change their selection of the extra-large hospitals according to the features available.

Fig. 1. exhibits the simulation of patient concentration in extra-large hospitals. This process explains the medical process of ordinary patients who do not have any acquaintance in the hospital and in the case of patients who have an acquaintance, reveals the obvious difference.

*Problems of the present system*

As shown in the above process, 3rd medical institutions that are selected by the patients and the families of the patients are concentrated on only a few of the extra-large hospitals. Hospitals with limited surgeons and limited operation rooms create a waiting list for the surgery and the patients then return home after they are informed of the scheduled surgery. Our comparison on the average waiting period in a few of the extra-large hospitals

(A) In case, the extra-large hospital is recommended at first



(B) In case, the extra-large hospital is not recommended at first

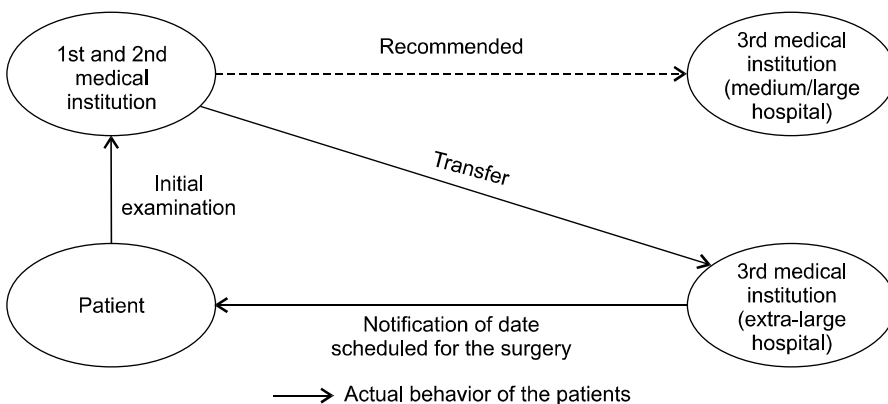


Fig. 1. Patient's behavior on selection of 3rd medical institution.

are 30 to 50 days for the extra-large hospitals whereas there is a wait of only three to five days for the medium/large hospitals. This shows that there is a big difference in the average waiting time for surgery between these two groups and it can be said that the unnecessary waiting time presented in the current system increases the fears of the patients and their families in unnecessary manner.

#### *Attempts of the Ministry of Health & Welfare to solve the problems and its limits*

The Ministry of Health and Welfare has been making many attempts to solve the problem population concentration of patients on extra-large hospitals. Through the research process, we have found the efforts of the Ministry of Health & Welfare to be as follows.

##### *Operation of National Cancer Information Center*

The Ministry of Health and Welfare established and run by the National Cancer Center, the National Cancer Information Center ([www.cancer.go.kr](http://www.cancer.go.kr)) published a database on cancer statistics from 2001 to present. They are trying to provide more information about cancers through online and offline consultation. People can obtain the information on recurrence or metastasis of the cancer through this system.

##### *HIRA opens assessment information of hospitals*

Health Insurance Review and Assessment Service (HIRA), under the Ministry of Health and Welfare, is making more practical attempts to offer the assessment information of hospitals to the public. When you visit the HIRA website ([www.hira.or.kr](http://www.hira.or.kr)), they provide information on the services so that you can compare the assessment results of the surgery, treatment and medication conducted by each hospital. In order to conduct this service, HIRA deduces the standard amount of treatment of each surgery through an assessment report of the amount of treatment indices. This report shows almost the same death rate of surgery in hospitals, which goes beyond the standard amount of treatment. So, this means that surgery results are almost the same in the hospitals that conduct a certain level of treatment whether it is an extra-large hospital or a medium/large hospital. The purpose of this report is to

open the list by classifying the medical institutions into hospitals performing above the standard amount of treatment, hospitals performing under the standard amount of treatment and also provides medical expenses and length of postoperative hospital stay so that patients can refer to costs as part of their selection of hospital. The agency also tries to solve the population concentration problems on the large size hospitals in metropolitan areas, so we can see that this attempt is made in the same context as our research. But it is difficult for ordinary people to discern the results of this research and it appears to be insufficient to realize its ultimate goals in reducing population concentration on extra-large hospitals that draw unnecessary waiting times for surgery.

## METHODS

### *Theoretical background*

The ultimate goal for this study is to switch the selection of the patients from the extra-large hospitals to medium/large hospitals. We found that patients tend to select hospitals based on the appearance of the available features such as facilities and accessibility and nonobjective information such as modernity and professional credibility. These factors sway patients into selecting extra-large hospitals. If so, how can we change the attitude and the behaviors of the patients? We focused on a dual-process model which is widely used in social psychology [9]. According to the classical dual-process model, if the given information is proved successfully, then the attitude of the informed recipients can change. Let us look into good examples of this model in detail.

The elaboration likelihood model (ELM), which was developed by Petty and Cacioppo [10], divided the route through which the recipients received information and divided their behaviors into 'central route (CR)' and 'peripheral route (PR)'. A decision made through CR means that the decision for their behavior is made according to the value of the effectiveness of the information determined through a persuasive and detailed explanation based on logical ideas. On the other hand, a decision through PR means the decision is made according to ex-

ternal properties of the information, credibility, and the attraction, etc. Also, which route will be chosen by the individuals depends on a strong motivation to conduct critical evaluation of the given information. Here, strong motivation means that the given information should be related to the individuals and it is formed based on the necessity of recognition by individuals. We can apply this model to our tasks to solve the current problems. In other words, if the information that the patients and their families need to select their hospitals based on the features of appearance such as facilities, modernity, and professional credibility, etc., this can be called a decision through 'PR' not 'CR' as ELM refers to it. In addition, the new variables which we found based on the treatment services is the information based on objective and logical data, so it can be interpreted as 'CR'. So, if we can change the route through which the patients and their families select hospitals from the current 'PR' to 'CR', we can possibly find new ways to solve this problem. In order to change the route, a strong motivation and a critical factor to decide the route are needed. The new information for the treatment services, which we intend to use in this study, is what have been lacking in, information on the disease itself. That is, a lack of understanding of treatment processes and a lack of communication between the medical team and the patients. Therefore, it will help the patients and the families of the patients to change the route of their decision making.

### Pre-interview

We have conducted interviews directly targeting cancer patients and their families to find out what information to consider in the aspect of the treatment services, the inborn medical services, unlike the peripheral factors such as the features of the appearance, modernity, and professional credibility such as those used before the selection of hospital.

### Outline of pre-interview

These interviews were conducted through 18 cancer patients and their families awaiting surgery at Severance Hospital. Ten questions were asked directly to the interviewees. The interview was divided into two sequences.

The 1st interview was conducted on the 22nd of May until the 23rd of May and the 2nd interview was from the 29th of May until the 30th of May. If a large number of respondents were interviewed, the results might have been more statistically significant. However, the interviewees were limited to a group of patients who are cancer patients and had already decided on the hospitals for surgery. Realistically, it was difficult to conduct face-to-face interviews and was impossible to gather more detailed interviewed data as a result.

### Pre-interview analysis

From the result of the responses, we could extract meaningful information from questions such as, "How long was the waiting time for surgery since your diagnosis was confirmed?" Most respondents answered '2 to 3 weeks' for the surgery. It was identified that most of the patients in the extra-large hospitals needed to wait longer for the surgery. Through the question "What information would be more useful for patients in selecting more appropriate hospitals?" we intended to find out what information is needed and wanted by patients in choosing more appropriate hospitals. Through this question, we could find three meaningful factors; 'information about cancer' and 'information on surgery scheduling' along with hospital quality systems being excluded, because it was this issue that was actively pursued through many different methods and not directly related to the purpose of this study. Lastly, to the question "Do you think it would make a difference among the extra-large hospitals?", thirteen respondents answered "there would be a difference" and 5 answered "there would be no difference". Nevertheless, according to evaluation reports from the Ministry of Health and Welfare and other medial assessment agencies, the differences were very insignificant. Therefore, it was discerned that most patients had incorrect prejudices about extra-large hospitals against the medium/large hospitals. The provision of such information has not been performed appropriately. We have determined that this provision of the information, that the differences between the extra-large hospitals and the medium/large hospitals were insignificant, could be another factor in distribution of patients.

To sum up the results, through the pre-interview, we could reach an interim conclusion that there existed provisions of information regarding three factors; 'the provision of information about cancer', 'the provision of information about the waiting time for surgery,' and 'the information about the differences in the results of surgery by each hospital,' factors influencing patients in their selection of hospitals.

#### *Definition of terms: extra-large hospitals and medium/large hospitals*

In the pre-interview stage, we showed examples of several hospitals directly to the respondents but we did not conduct the research such as having the respondents make a hospital selection. In contrast to the latter test, there were cases where the patients should make a choice between the extra-large hospitals and the medium/large hospitals. So, the terms 'extra-large hospitals' and 'medium/large hospitals' need to be defined since they will be continuously referred throughout this study. The two groups of hospitals are classified as extra-large hospitals and medium/large hospitals based on the criteria established by the researchers of this study and can be affiliated to another group in other studies with different criteria.

There are two major criteria for selecting hospitals in the category of extra-large hospitals. Firstly, they are the so-called 'top four' hospitals. These top four hospitals cut conspicuous figures among many hospitals in Korea. These hospitals are visited by many patients with various diseases and the patients come not only from Seoul but also from other districts. Secondly, the main criterion for the selection is the size of the hospital. As we can see from the term 'extra-large hospital', it means a hospital that can accommodate large numbers of patients; as an index for the capacity of the accommodation, generally the number of sickbeds is referred to. These hospitals have more than 2,000 beds. We selected four hospitals in the group of extra-large hospitals: hospital 1, hospital 2, hospital 3, hospital 4. The names of the hospitals were given to the interviewees before the interviews for brand image recognition. Then the criteria for the medium/large hospitals are also selected based on following two criteria. Because there are many medium/large hospitals, the hos-

pitals that have competitiveness compared with the extra-large hospitals should be selected.

Firstly, the medium/large hospitals located in Seoul should be selected as the selection of extra-large hospitals is. Secondly, we selected hospitals affiliated with universities. This is because these hospitals were capable of providing the same level of treatment as the extra-large hospitals, so we were able to compare and distribute patients to medium/large hospitals. Through these two selection criteria, we selected four hospitals in the group of the medium/large hospitals: hospital A, hospital B, hospital C, hospital D. The names are also given to the interviewees for recognition of their brand image.

#### *Pilot survey*

##### *Outline of pilot survey*

We have judged that for the selection of hospitals, there existed three variables; 'The provision of the information about cancer,' 'the provision of the information on the differences in surgical results by each hospital,' and 'the provision of the information on the waiting time for surgery by each hospital.' Prior to our final proposal of an effective distribution system, it was necessary for us to decide the validity of these variables. In order to measure the validity of these variables, we conducted a pilot survey intended to verify whether the variables, which were deduced from the pre-interview, could really influence the selection of the hospitals or whether they could be used as variables.

##### *Configuration of pilot survey*

The pilot survey was conducted by means of a repeated survey and targeted master of business administration graduated students in a night time course. The test was conducted in such a way that the surveyor provided the information about the variables, whose validity was to be confirmed, through presentation, and the respondents selected the hospitals at the end of each session. By looking into the process in detail, the test was conducted for total 20 minutes and contained 12 questions, and they were divided into four sessions as follows.

In the first session, the personal data and the level of knowledge about cancer of the respondents were collected

and asked only which hospital they would select based on the given information limited to the size of the hospitals. In the second session, the surveyor provided the information about cancer for three minutes through slides and then questioned which hospital they would select based on the given information. In the third session, the information about 'the difference of the surgical results by each hospital' was provided to the respondents and the same question was asked. In the fourth and last session, the information about 'the waiting time for surgery by each hospital' was provided and then 'which hospital they would select' was asked to the respondents. And the information provided between each session was written based on 'the evaluation report of the amount of treatment index by HIRA, 2009. 2'. Total respondents were 50 and the test was conducted in the lecture room in the same graduate school between the 24th of May and the 28th of May.

*Analysis of pilot survey*

In the repeated surveys consisting of four sessions, the influence of the variables can be determined according to the rate of variation on each selection. In other words, if a respondent selects a hospital called A and selects the information called X during the 2nd session and selects a hospital called B to answer the question to select a hospital again at the end of the session, it can be said that the information X influenced the respondents. By looking into the results, the number of respondents who changed their hospital selection through the provision of information

about cancer between the selection of hospital in the first session and second session was seven out of 50. The number of respondents who changed their hospital selection through the provision of information on the difference of surgical results between the selection of hospital in the second session and the third session was 12 out of 50. The number of respondents who changed their selection of hospital through the provision of information on waiting time for surgery between the selection of hospital in the third session and the fourth session was 41 out of 50. If this is converted into percentage, the variation in the selection of hospital between the selection of the first hospital and second hospital is 14%. The variation in the selection of hospital between the selection of the second hospital and third hospital is 24%. The variation in the selection of the hospital between the selection of the third hospital and the fourth hospital is 82%. When looking into the influence of each hospital selection variable, our observation could conclude that the variable 'the provision of the information about cancer' was relatively insignificant but that the variable 'the provision of the information about surgical results by each hospital' was significant.

*Conclusions from pilot survey*

The aim of the pilot survey was to determine the variables to be used for the effective distribution system on extra-large hospitals, which was ultimately meant to be proposed in this study by measuring of the validity of each variable. As a result, variables of 'the provision of in-

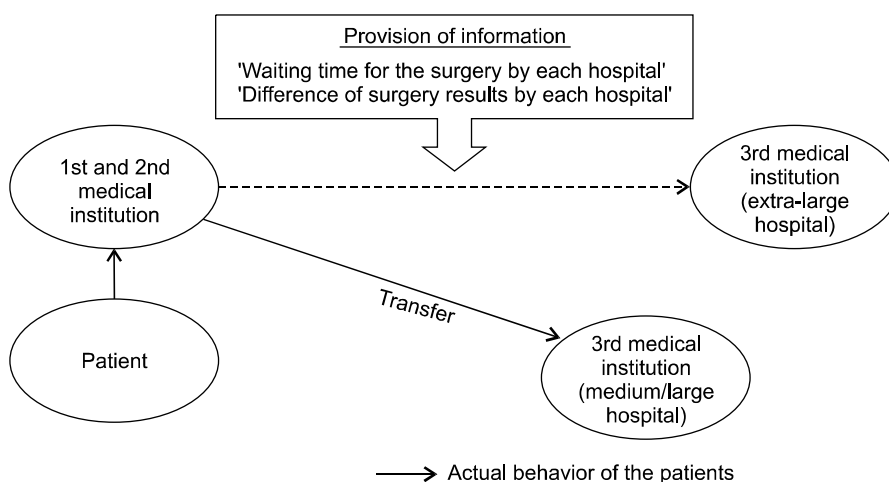


Fig. 2. The effective patients distribution system to medium/large hospitals.

formation on the difference of surgical results' and 'the provision of information on waiting time for surgery' influence over the patients on their selection of hospital.

## Proposal and test of the effective distribution systems

### Proposal of the effective distribution system

We applied the ELM of Petty and Cacioppo [10], which was referred to earlier, had the patients and their families select the medium/large hospitals that can offer a relatively shorter waiting time for surgery with similar surgical results compared with the extra-large hospitals through a new central route, not the peripheral route which they had previously used for their selection for the hospital, the result of which had been uneven distribution of population concentration on the extra-large hospitals. For the CR, which will be used at this time, we intend to use the information that is 'the waiting time for the surgery' and 'the difference of surgical results by each hospital' that are identified as valid, and we reckon this information will be enough to arouse strong motivation among patients. We propose the effective distribution system as in Fig. 2.

### Field test

We conducted a field test in order to substantiate the effective distribution system which we proposed.

#### *Configuration of the field test*

A field test was conducted in the method of Web Simulation Survey. We opened a virtual site in the Web and conducted the test targeting 100 patients. Even though we targeted the patients, we considered the age tier of the cancer patients and constituted the respondents in a group of 20 to 50-year-olds, for the accuracy of the test. A total of 100 respondents were divided into 4 groups of 25 respondents and the different information was provided to each group. As the information to each group was different, the amount of the content of the web page was composed differently for each group and the information provided to each group was written based on 'the evaluation report for the amount of treatment index by HIRA, 2009.

2'. Since it was web based research, the test was opened from the 15th of July till the 31st of July and conducted in many different places.

#### *Configuration of the groups for field test*

The research was conducted providing groups with different information. No information was provided to control group 1, where the respondents selected the hospital only with the basic information they had. For the experimental group, they were divided into groups 2, 3, and 4. The information about the difference of surgical results by each hospital was given to group 2 and the information on waiting time for surgery was provided to group 3. To the last group, group 4, both the information about the difference of surgical results by each hospital and the information on waiting time for surgery were provided for their selection of the hospitals.

#### *Establishment of the hypothesis for field test*

In order to identify the relationship between the provision of information and the patients' selection of hospital, we establish the hypothesis as follows and verified by using the one-way ANOVA.

H1: The provision of the information about the difference of surgical results will influence the selection of the hospital.

H2: The provision of the information on waiting time for surgery will influence the selection of the hospital.

H3: The simultaneous provision of information about the difference of surgical results and waiting time for surgery will influence the selection of the hospital.

## RESULTS

### Analysis of field test result

For the analysis of test result, SPSS ver. 17.0 (SPSS Inc., Chicago, IL, USA) was used with one-way ANOVA method. For ANOVA analysis, a dependent variable was set as the selected category and a fixed factor was set as a group. This setup of variables was to find out whether there is a difference in the average of a select category ac-



**Table 1.** Result of multiple comparison among groups

Group	Mean difference	Standard error	Significance	95% confidence interval	
				Lower bound	Upper bound
1, 2	-0.12	0.127	0.782	-0.45	0.21
3	-0.24	0.127	0.241	-0.57	0.09
4	-0.56	0.127	0.000	-0.89	-0.23

Conducted by multiple comparison method, analysis of variance.

According to the variation of a group or not. By analyzing the data of the test results, it was deduced that F value was 7.160 and the critical value was 2.699. With these values, F-test was conducted. F-test values were in the critical region, so null hypothesis of the hypothesis, which was used in the field test, could be dismissed. In other words, the effective distribution system proposed in this study is statistically significant.

### Multiple comparisons

We conducted multiple comparisons among groups as shown in Table 1 in order to determine the validity of the proposed effective distribution system as the comparison of the difference in population means of each group in detail.

Through comparison among the above groups, we can see the population between control group 1 and experimental group 2, 3 and 4 are significant. Therefore, we found that the result was a little different from what we expected. In other words, the comparison between control group 1 against experimental group 2 was not significant and controlled group 1 against experimental group 3 was not significant either. Only the difference of the population between control group 1 against experimental group 4 was statistically significant. This means that the null hypothesis of the effective distribution system 1 (H1) could not be dismissed. The group that was provided with the information about the difference of surgical results was not influenced for the selection of hospital. The null hypothesis of the effective distribution system 2 (H2) could not be dismissed, so the group that was provided with the information about the waiting time for the surgery was not influenced for the selection of the hospital either. Only group 4, provided with both the information

about 'the difference of surgical results' and 'the waiting time for surgery', had difference in significance. The null hypothesis of the effective distribution system 3 (H3) could be dismissed. As it shows, it could be known that if information on both 'the difference of the surgical results' and 'the waiting time for surgery' was provided at the same time, the selection of the hospital would be influenced.

Putting all these together, when the patient is in the process to select their hospital, if they are provided with either the information of 'the difference of the surgical result' or 'the waiting time for surgery' effective distribution cannot be expected. However, if the patients were to be provided with both sets of information, they will be influenced in their selection of hospitals, resulting in effective distribution.

## DISCUSSION

### Summary of study

We have concluded that the problem of population concentration in extra-large hospitals was due to an uninformed or mis-focused process when it comes down to selecting the hospital. In order to solve this problem, it is necessary to provide new information to the patients and their family. Furthermore, the new information needs to have direct relevance and strong enough to motivate patients so as to influence the decision making of the hospital. Therefore, we investigated the information that was needed and wanted by the patients and their families through the pre-interview.

We found that the information we have deduced from the pre-interviews was based on practical therapy treat-

ment services for patients. With that, we conducted a pilot test to identify two valid variables. One of the two selected variables is the provision of 'the waiting time for surgery by each hospital' which showed the average waiting time for surgery in each hospital. The other variable is the information of 'the difference of surgical results by each hospital.' That information contains the insignificant difference of the surgical results between extra-large hospitals and the medium/large hospitals.

With these two variables, we proposed an effective distribution system that is verified through the field test. After the initial diagnosis and treatment from the 1st and 2nd medical institutions, patients needed to be informed on both the 'the waiting time for surgery,' and 'the difference of surgical results.' This will avoid the unnecessary congestion and population concentration of extra-large hospitals by behavioral change in patients and their families. By providing two sets of information to patients, reckless selection of extra-large hospitals can be spread to more appropriate hospitals and therefore achieve effective distribution of the population concentration on extra-large hospital.

### Implications

Domestic information technology (IT) industry evolves day by day and its incorporation with other industries provides more variations and convenient information enabling better selections. For example, internet sites simultaneously provide comparisons of various information; product info, prices, delivery time, etc. With this tool, consumers can make better informed choices.

Moreover, Seoul installed monitors, displaying the waiting time for buses at bus stops and informs users on buses' status. Unlike these, however, it is difficult to combine IT with medical industries. This is due to the uniqueness of the market like operating rooms, which are not open to the public. However, we have to admit that it is possible that we all could become a patient and need to make informed decisions in terms of the issues we discussed. In other words, the information system that can be used by patients for their selection of hospital is inevitably required. The concentration of patients on the extra-large hospitals and unnecessary waiting times for sur-

gery are more serious problems in the aspect of the medical services. It is because the current medical institutions are recognized as providing quality services rather than an authoritative institution and the medical institutions themselves also spare no effort to provide better medical service. But it shouldn't be overlooked that real medical services for patients is not a comfortable environment or pleasant topic for patients. In this respect, the concentration of patients in extra-large hospitals causes unnecessary waiting time for surgery, increases the anxiety of patients, and wastes social resources. That is the result of an inefficient information system. Therefore, the effective distribution system proposed in this study can be meaningful and should be continually studied to materialize this system.

### Limitations and directions of the future research

This study is not intended to serve customers but only to represent a new treatment service in the medical field. Also, the provision of a new information-based, effective distribution system on treatment service influence patients' behavior in selecting hospital.

However, we realized two limitations in this research. First, the respondents, who participated in the verification of the effective distribution system proposed in this study, consisted of the acquaintance of the researchers and only contained 25 people in each group. Therefore, it will be difficult to apply the results to the medical industry as a whole. Future studies are suggested to target greater numbers of patients and their families as well as more hospitals and their medical teams. With more data to be assessed, the more variables can be analyzed; such as the sensitivity of the treatment depending on the patients' educational level, influence of the information on the medical expenses, and the record or knowledge of surgeons to select a hospital. As shown in preceding studies, many studies have been conducted to reduce the anxiety of patients on the day of surgery, but no study has been done on the anxiety of patients, who were confirmed with a grave illness but sent back home during the waiting period. Therefore, studies related to this blind spot should be carried out. The effective distribution system proposed in this study can be used as the ground data for supplementary studies in the

future. As well, concentrations of patients to extra-large hospitals are also caused by a higher expectation of service and care. The value of one's life is the strongest among one's belongings. Especially, medical surgeries are directly and indirectly supporting or damaging to that value. To protect its value, patients prefer to purchase a better and higher quality service. Since we do not have access to more data such as number of surgeries performed per year, probability of full recovery, probability of complications, and the surgeon and his/her team's scholarly recognitions or public reputation from each hospital, studies and research are also limited in reflecting this reality.

### CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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