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# The Effect of Overtreatment at Medical Institutions on the Recovery and Satisfaction of Patients

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ABSTRACT

The purpose of this study was to analyze the effect of overtreatment of inpatients at medical institutions on recovery and satisfaction.

In this study, 1,098 inpatients excluding missing values were analyzed using the 6th to 10th Korea Health Panel Survey (KHPS). To identify the relationship between overtreatment and recovery and satisfaction, the chi-square test and generalized estimation equation were used for the analysis.

Compared to the group that answered 'not at all' about overtreatment, the negative recovery degree of the group that responded 'very much so' was 2.995 times higher (Odds Ratio [OR]: 2.995, 95% Confidence interval: 1.338 -6.705, P-value 0.008), and dissatisfaction was 35.272 times higher (OR: 35.272, 95% CI: 14.682-84.750, P-value <0.001). Furthermore, as a result of stratified analysis of the correlation between overtreatment and recovery and satisfaction according to whether the selection treatment was recommended, the group who responded 'very yes' to the overtreatment or not among the group who received the selection treatment recommendation was 'not at all' compared to the group that responded, their negative recovery rate was 5.553 times higher and the degree of dissatisfaction was 271.375 times higher. Whereas, in the case of the group not recommended for elective treatment, the negative recovery rate was 2.775 times higher and the dissatisfaction rate was 26.656 times higher.

As a result of the study, the higher the group with a stronger awareness of overtreatment, the higher the degree of patient dissatisfaction and discomfort, and a particularly strong correlation was found in the group recommended for selective treatment. Hence, if the institutional standards for providing appropriate medical care to the group experiencing excessive medical treatment through medical institutions and sufficient explanations about the medical services provided to patients are provided, the satisfaction and recovery of patients will increase, and it is expected to be used as the basic data for preparing policy and institutional measures towards that end.

## 1. Introduction

Since the implementation of national medical insurance in 1989, Korean people have been guaranteed the right to health by the state (Lee, 2014), and Korea's current medical expenditure announced by the Organization for Economic Cooperation and Development (OECD) has decreased from 6% in 2011 to 2020. It is continuously increasing at 8.4% (Ministry of Health and Welfare, 2021). Furthermore, the annual number of visits to medical institutions per person in Korea was 17.2 in 2019, more than twice as high as the OECD average of 6.8, and the highest among OECD member countries (Ministry of Health and Welfare, 2021). The reason for such increase in medical expenses and visits to medical institutions is that Korea has entered an aged society with 16.4% of the population aged 65 or older, and is expected to enter a super-aged society with 20.1% in 2025 (Cheong & Lee, 2017; KOSIS, 2021), increased use of nursing hospitals (Lee & Lee, 2016), and increased chronic diseases (Bae, 2014). Furthermore, it was investigated that medical use increased among young people due to preventive medical use and an increase in indemnity insurance subscription (You & Kwon, 2012). Furthermore, excessive treatment, which has been raised as a problem of continuous increase in medical expenses since the implementation of national medical insurance, is also cited as one of the causes (Cheong & Park, 2016). Overtreatment refers to the act of providing medical services to patients beyond the appropriate level despite no medical evidence that it will help improve the patient's health and recovery. The main cause of overtreatment is the scientific basis for disease There are various things such as shortage (Berwick & Hackbarth, 2012), increased sensitivity to various tests (Ebell & Herzstein, 2015), and overuse of medical care by patients by health insurance type (Song, 2015). According to the results of the 'Survey on the value of health insurance premiums and appropriate medical use' conducted by the National Health Insurance Corporation in 2019 on adult men and women aged 19 and older (National Health Insurance Service, 2019), 46.9% of the insurance subscribers responded that they were using medical institutions more than necessary, half of the people said that they were using excessive medical services. (National Health Insurance Service, 2019). Furthermore, in a previous study in Korea, it was revealed that overtreatment occurred because all additional costs other than the set fee were borne by the patient through the selective treatment system, in which a patient selects a specific doctor to receive treatment when receiving treatment at a medical institution (Han, 2019).

Excessive medical treatment, widespread at home and abroad, is causing various problems to patients and health authorities. According to the previous studies, the use of excessive medicines and medical devices for importing medical institutions increases the national insurance financial burden and worsens patient health. reported to occur (Ministry of Health and Welfare & Seoul National University, 2000; Shaffer & Scherer, 2018), and as such, the perception of overtreatment affects the patients' satisfaction with medical institutions and the degree of recovery (Park, Yang, & Chang, 2015). However, according to a preceding study by the Ministry of Health and Welfare (Ministry of Health and Welfare & Seoul National University, 2000), the use of antibiotics, which caused deterioration in the patients' health, decreased by 24.92% by suppressing overtreatment for some disease groups, and the number of days of hospitalization decreased by 24.92%. It thereby produced positive effects such as reduction in the financial burden of medical expenses, such as

a reduction in the total amount of medical services provided, and improvement in patient health.

However, most previous studies have identified the causes of overtreatment (Bae, 2014; Cheong & Lee, 2017; KOSIS, 2021; Lee & Lee, 2016; You & Kwon, 2012) and the deterioration of medical finance due to overtreatment (Hadler, 2007), and there are not many studies on the effect of overtreatment on the individuals. Hence, this study is based on the situation in which overmedical treatment treatment is emerging as a social problem in Korea (Cheong & Park, 2016) and the previous studies that suggest that overmedical treatment treatment reduces the satisfaction of medical institutions and the provision of additional drugs that affect patients' personal health (Hadler, 2007; Park, 2015), it is sought to study the relationship between overtreatment and satisfaction with the degree of recovery and satisfaction in the patients. The correlation between recovery and satisfaction was analyzed in detail. Based on which, it is intended to establish the policy and institutional measures to improve the degree of recovery and satisfaction for the group who received excessive medical treatment and provide them as the basic data.

## 2. Research Method

### *2.1 Research materials and research subjects*

This study used the data from the 6th to 10th Korea Health Panel Survey (KHPS). The Korea Health Panel Survey was conducted to provide the basic information on policy implementation to improve responsiveness, accessibility and efficiency of the national health care system. It was established to generate individual and household unit statistics on behavior and to identify related factors. It also seeks to build and provide the basic data that can comprehensively and in-depth analyze factors affecting medical use and medical expenditure as well as information on medical use patterns and scale of medical expenditure. The Korea Health Panel Survey uses 90% of all data from the 2005 Population and Housing Survey as the frame of extraction to maintain national representativeness. In the selection of sample households, the sample survey district (colony) was extracted in the first step, the sample households in the sample survey district were extracted in the second step, and the probability proportional stratified colony sampling method was selected in the second step. The total number of survey districts was about 350, and about 8,000 households nationwide and household members belonging to those households were surveyed.

In this study, 1,098 patients with no hospitalization experience or 20,185 non-respondents were analyzed among 21,283 subjects, and the correlation between overtreatment at medical institutions and patient satisfaction and recovery was analyzed.

### *2.2 Independent variable*

In this study, the independent variable, overtreatment, was asked through the 6th to 10th Korea Health Panel Survey questionnaires, "Do you feel that you have received unnecessary treatment or tests?" It was surveyed as a self-administered questionnaire in which one was selected for the

response index of “yes”, “so so”, “not so”, and “not so”.

### 2.3 Dependent variables

#### 2.3.1 Degree of recovery

As for the degree of recovery, which is the dependent variable of this study, the question “Do you think you have recovered sufficiently after being discharged?” was asked through the 6th to 10th Korea Health Panel Survey questionnaires, and the response indicators of “discomfort” and “recovery” were measured.

#### 2.3.2 Satisfaction

For satisfaction, the dependent variable of this study, the question “How satisfied were you with the overall service during your stay in the hospital?”, “Dissatisfied”, and “Very dissatisfied” response indicators were measured.

### 2.4 Control variable

In this study, as the demographic and socioeconomic factors, the data predefined as “gender”, “age”, and “region” from the Korea Health Panel Survey were selected as variables. Gender was classified as “male” or “female”, and age was “less than 19 years old”, “20-29 years old”, “30-39 years old”, “40-49 years old”, “50-59 years old”, and 60 years of age or older”. Regions were classified into “Seoul”, “Metropolitan Cities”, and “Others”. As variables for characteristics of medical use and medical expenses, predefined data such as “non-reimbursement”, “optional treatment recommendation”, “optional treatment presence or absence”, “hospitalization decision”, “type of medical institution”, and “hospitalization days” were selected as variables. Non-salary benefits were classified as “00,000 won”, “10,000-240,000 won”, “250,000-490,000 won”, “500,000-990,000 won”, and “more than 1,000,000 won”, and recommendations for elective treatment were classified as “yes” and “no”. did The presence of elective treatment was classified as “yes” or “no”, and the hospitalization decision was classified as “medical staff”, “person”, or “other”. The type of medical institution was classified as “high-level general hospital,” “hospital-level,” and “other,” and the number of hospitalization days was “1-7 days,” “8-14 days,” “15-21 days,” and “22-28 days”, and classified as “more than 29 days”. Finally, to compensate for the yearly difference in this study, it was classified from 2011 (6th) to 2015 (10th).

### 2.5 Analytical method

In this study, to analyze the correlation between excessive treatment at medical institutions and the degree of recovery and satisfaction of inpatients, after controlling for variables such as non-reimbursement, selective treatment recommendation, hospitalization decision, gender, age, region, type

of medical institution, and number of days of hospitalization, It was analyzed using the chi-square test and the generalized estimation equation. SAS ver 9.4 (SAS Institute Inc., Cary, NC, USA) was used for organizing and statistical analysis of the collected data, and statistical significance was tested at the 5% significance level.

## 3. Results

Table 1 demonstrates the general characteristics of the participants to find out the relationship between overtreatment and the patient's recovery and satisfaction. Of the total 1,098 subjects, 37.1% (n = 407) of the non-recovered group and 62.9% (n = 691) of the recovery group, 92.7% (n = 1,018) of the satisfied group, and 7.3% of the dissatisfied group (n = 80). 0.7% (n = 8) of the group responded "very much" to the question of overtreatment, and among them, the recovered rate was 50% (n = 4) and satisfaction was 25% (n = 2). In the case of the group that answered 'so so', 18.6% (n = 204) of the total subjects, of which the recovered rate was 62.8% (n = 128) and satisfaction was 89.7% (n = 183).' 10.6% (n = 116) answered 'not at all', the recovery rate of the group was 75.9% (n = 88), and the satisfaction rate was 98.3% (n = 114).

**Table 1.** General characteristics of subjects included for analysis

| Variables | Recovery | | | | | | | Satisfaction | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | | Non-Recoveried | | Recoveried | | | Satisfied | | Unsatisfied | | |
| | N | % | N | % | N | % | P-value | N | % | N | % | P-value |
| Overtreatment in medical facility | | | | | | | 0.009 | | | | | <.0001 |
| Very Probable | 8 | 0.7 | 4 | 50.0 | 4 | 50.0 | | 2 | 25.0 | 6 | 75.0 | |
| Probable | 42 | 3.8 | 22 | 52.4 | 20 | 47.6 | | 35 | 83.3 | 7 | 16.7 | |
| Moderate | 204 | 18.6 | 76 | 37.3 | 128 | 62.8 | | 183 | 89.7 | 21 | 10.3 | |
| Probably not | 728 | 66.3 | 277 | 38.1 | 451 | 62.0 | | 684 | 94.0 | 44 | 6.0 | |
| Not at all | 116 | 10.6 | 28 | 24.1 | 88 | 75.9 | | 114 | 98.3 | 2 | 1.7 | |
| non-reimbursement (10,000WON) | | | | | | | 0.416 | | | | | 0.666 |
| 0 | 185 | 16.9 | 65 | 35.1 | 120 | 64.9 | | 174 | 94.1 | 11 | 6.0 | |
| 1-24 | 403 | 36.7 | 141 | 35.0 | 262 | 65.0 | | 369 | 91.6 | 34 | 8.4 | |
| 25-49 | 158 | 14.4 | 58 | 36.7 | 100 | 63.3 | | 146 | 92.4 | 12 | 7.6 | |
| 50-99 | 166 | 15.1 | 63 | 38.0 | 103 | 62.1 | | 153 | 92.2 | 13 | 7.8 | |
| Over 100 | 186 | 16.9 | 80 | 43.0 | 106 | 57.0 | | 176 | 94.6 | 10 | 5.4 | |
| Premium Treatment advice / use | | | | | | | 0.001 | | | | | 0.264 |
| Yes/Yes | 170 | 15.5 | 46 | 27.1 | 124 | 72.9 | | 158 | 92.9 | 12 | 7.1 | |
| Yes/No | 9 | 0.8 | 6 | 66.7 | 3 | 33.3 | | 7 | 77.8 | 2 | 22.2 | |
| No/Yes | 120 | 10.9 | 58 | 48.3 | 62 | 51.7 | | 114 | 95.0 | 6 | 5.0 | |
| No/No | 799 | 72.8 | 297 | 37.2 | 502 | 62.8 | | 739 | 92.5 | 60 | 7.5 | |

| Variables | | | Recovery | | | | | Satisfaction | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | | Non-Recoveried | | Recoveried | | | Satisfied | | Unsatisfied | | |
| | N | % | N | % | N | % | P-value | N | % | N | % | P-value |
| Hospitalization decision | | | | | | | 0.741 | | | | | 0.843 |
| Medical staff | 952 | 86.7 | 357 | 37.5 | 595 | 62.5 | | 884 | 92.9 | 68 | 7.1 | |
| Myself | 115 | 10.5 | 39 | 33.9 | 76 | 66.1 | | 106 | 92.2 | 9 | 7.8 | |
| Other | 31 | 2.8 | 11 | 35.5 | 20 | 64.5 | | 28 | 90.3 | 3 | 9.7 | |
| Sex | | | | | | | 0.627 | | | | | 0.066 |
| Male | 469 | 42.7 | 170 | 36.3 | 299 | 63.8 | | 427 | 91.0 | 42 | 9.0 | |
| Female | 629 | 57.3 | 237 | 37.7 | 392 | 62.3 | | 591 | 94.0 | 38 | 6.0 | |
| Age | | | | | | | <.0001 | | | | | 0.073 |
| Under 19 | 135 | 12.3 | 20 | 14.8 | 115 | 85.2 | | 132 | 97.8 | 3 | 2.2 | |
| 20-29 | 47 | 4.3 | 6 | 12.8 | 41 | 87.2 | | 46 | 97.9 | 1 | 2.1 | |
| 30-39 | 118 | 10.8 | 29 | 24.6 | 89 | 75.4 | | 110 | 93.2 | 8 | 6.8 | |
| 40-49 | 115 | 10.5 | 41 | 35.7 | 74 | 64.4 | | 106 | 92.2 | 9 | 7.8 | |
| 50-59 | 176 | 16.0 | 72 | 40.9 | 104 | 59.1 | | 164 | 93.2 | 12 | 6.8 | |
| Over 60 | 507 | 46.2 | 239 | 47.1 | 268 | 52.9 | | 460 | 90.7 | 47 | 9.3 | |
| Region | | | | | | | 0.500 | | | | | 0.310 |
| Seoul | 137 | 12.5 | 47 | 34.3 | 90 | 65.7 | | 131 | 95.6 | 6 | 4.4 | |
| Metropolitan | 303 | 27.6 | 107 | 35.3 | 196 | 64.7 | | 282 | 93.1 | 21 | 6.9 | |
| Rural | 658 | 59.9 | 253 | 38.5 | 405 | 61.6 | | 605 | 92.0 | 53 | 8.1 | |
| Type of hospital | | | | | | | 0.070 | | | | | 0.565 |
| Tertiary hospital | 167 | 15.2 | 55 | 32.9 | 112 | 67.1 | | 155 | 92.8 | 12 | 7.2 | |
| Secondary hospital | 733 | 66.8 | 289 | 39.4 | 444 | 60.6 | | 676 | 92.2 | 57 | 7.8 | |
| Other medical institutions | 198 | 18.0 | 63 | 31.8 | 135 | 68.2 | | 187 | 94.4 | 11 | 5.6 | |
| Hospitalization days | | | | | | | <.0001 | | | | | 0.030 |
| 1-7 | 670 | 61.0 | 203 | 30.3 | 467 | 69.7 | | 627 | 93.6 | 43 | 6.4 | |
| 8-14 | 250 | 22.8 | 88 | 35.2 | 162 | 64.8 | | 232 | 92.8 | 18 | 7.2 | |
| 15-21 | 80 | 7.3 | 53 | 66.3 | 27 | 33.8 | | 67 | 83.8 | 13 | 16.3 | |
| 22-28 | 39 | 3.6 | 25 | 64.1 | 14 | 35.9 | | 36 | 92.3 | 3 | 7.7 | |
| Over 29 | 59 | 5.4 | 38 | 64.4 | 21 | 35.6 | | 56 | 94.9 | 3 | 5.1 | |
| Total | 1,098 | 100.0 | 407 | 37.1 | 691 | 62.9 | | 1,018 | 92.7 | 80 | 7.3 | |

Table 2 is the result of adjusting other control variables to find out the correlation between the degree of recovery and satisfaction of inpatients according to overtreatment. Compared to the group that answered ‘not at all’ about overtreatment, the recovery degree of the group that answered

'very much so' was 2.995 times (Odds Ratio [OR]: 2.995, 95% Confidence interval: 1.338-6.705, P-value 0.008) was negative, and satisfaction was negative by 35.272 times (OR: 35.272, 95% CI: 14.682-84.750, P-value <0.001). The degree of recovery of the group that answered 'generally yes' was negative by 2.227 times (OR: 2.227, 95% CI: 1.652-3.001, P-value <0.001), and satisfaction was 3.858 times (OR: 3.858, 95% CI: 1.652-3.001). % CI: 2.325-6.403, P-value <0.001) was negatively investigated. In the group that responded 'so so', the degree of recovery was negative by 1.931 times (OR: 1.931, 95% CI: 1.579-2.361, P-value <0.001), and satisfaction was 2.292 times (OR: 2.292, 95% CI: 1.579-2.361). % CI: 1.515-3.466, P-value < 0.001) turned out to be negative. The degree of recovery of the group that responded 'not at all' about overtreatment was 1.546 times higher than that of the group that responded 'not at all' (OR: 1.546, 95% CI: 1.305-1.831, P-value <0.001) was found to be negative, and satisfaction was found to be negative by 0.711 times (OR: 0.711, 95% CI: 0.711-1.531, P-value: 0.830).

**Table 2.** Adjusted effect between Overtreatment and Non-Recovery or unsatisfacation

| | Non-Recovery | | | | Unsatisfaction | | | |
|---|---|---|---|---|---|---|---|---|
| | OR | 95%CI | | P-value | OR | 95%CI | | P-value |
| Overtreatment in medical facility | | | | | | | | |
| Very Probable | 2.995 | 1.338 | 6.705 | 0.008 | 35.272 | 14.682 | 84.750 | <.0001 |
| Probable | 2.227 | 1.652 | 3.001 | <.0001 | 3.858 | 2.325 | 6.403 | <.0001 |
| Moderate | 1.931 | 1.579 | 2.361 | <.0001 | 2.292 | 1.515 | 3.466 | <.0001 |
| Probably not | 1.546 | 1.305 | 1.831 | <.0001 | 1.043 | 0.711 | 1.531 | 0.830 |
| Not at all | 1.000 | | | | 1.000 | | | |
| non-reimbursement (10,000WON) | | | | | | | | |
| 0 | 1.000 | | | | 1.000 | | | |
| 1-24 | 1.024 | 0.862 | 1.215 | 0.788 | 1.410 | 0.955 | 2.081 | 0.084 |
| 25-49 | 1.080 | 0.884 | 1.321 | 0.452 | 1.298 | 0.827 | 2.038 | 0.257 |
| 50-99 | 1.151 | 0.940 | 1.409 | 0.175 | 1.286 | 0.819 | 2.019 | 0.274 |
| Over 100 | 1.437 | 1.171 | 1.764 | 0.001 | 1.221 | 0.773 | 1.928 | 0.392 |
| Premium Treatment advice / use | | | | | | | | |
| Yes/Yes | 1.000 | | | | 1.000 | | | |
| Yes/No | 1.738 | 0.951 | 3.178 | 0.072 | 1.097 | 0.359 | 3.359 | 0.871 |
| No/Yes | 1.261 | 1.027 | 1.547 | 0.026 | 1.021 | 0.674 | 1.546 | 0.922 |
| No/No | 1.181 | 0.991 | 1.408 | 0.063 | 1.013 | 0.712 | 1.442 | 0.943 |
| Hospitalization decision | | | | | | | | |
| Medical staff | 1.238 | 1.028 | 1.492 | 0.025 | 1.260 | 0.812 | 1.956 | 0.302 |
| Myself | 1.000 | | | | 1.000 | | | |
| Other | 2.031 | 1.404 | 2.937 | 0.000 | 1.742 | 0.839 | 3.615 | 0.136 |
| Sex | | | | | | | | |
| Male | 1.000 | | | | 1.000 | | | |
| Female | 0.959 | 0.866 | 1.063 | 0.430 | 0.836 | 0.674 | 1.036 | 0.102 |

| | Non-Recovery | | | | Unsatisfaction | | | |
|---|---|---|---|---|---|---|---|---|
| | OR | 95%CI | | P-value | OR | 95%CI | | P-value |
| Age | | | | | | | | |
| Under 19 | 1.000 | | | | 1.000 | | | |
| 20-29 | 1.804 | 1.321 | 2.465 | 0.000 | 0.696 | 0.325 | 1.489 | 0.351 |
| 30-39 | 1.939 | 1.495 | 2.515 | <.0001 | 1.005 | 0.582 | 1.737 | 0.985 |
| 40-49 | 3.153 | 2.474 | 4.017 | <.0001 | 1.262 | 0.770 | 2.069 | 0.356 |
| 50-59 | 3.195 | 2.539 | 4.021 | <.0001 | 1.266 | 0.795 | 2.016 | 0.320 |
| Over 60 | 4.245 | 3.460 | 5.208 | <.0001 | 1.703 | 1.150 | 2.521 | 0.008 |
| Region | | | | | | | | |
| Seoul | 1.132 | 0.951 | 1.346 | 0.163 | 0.907 | 0.616 | 1.337 | 0.623 |
| Metropolitan | 1.013 | 0.903 | 1.137 | 0.821 | 1.174 | 0.927 | 1.485 | 0.183 |
| Rural | 1.000 | | | | 1.000 | | | |
| Type of hospital | | | | | | | | |
| Tertiary hospital | 0.943 | 0.771 | 1.153 | 0.567 | 0.989 | 0.649 | 1.508 | 0.959 |
| Secondary hospital | 0.959 | 0.830 | 1.107 | 0.566 | 0.935 | 0.683 | 1.280 | 0.675 |
| Other medical institutions | 1.000 | | | | 1.000 | | | |
| Hospitalization days | | | | | | | | |
| 1-7 | 1.000 | | | | 1.000 | | | |
| 8-14 | 1.205 | 1.059 | 1.371 | 0.005 | 1.347 | 1.027 | 1.765 | 0.031 |
| 15-21 | 2.246 | 1.874 | 2.691 | <.0001 | 1.657 | 1.162 | 2.362 | 0.005 |
| 22-28 | 2.558 | 1.924 | 3.402 | <.0001 | 2.127 | 1.309 | 3.456 | 0.002 |
| Over 29 | 2.820 | 2.199 | 3.617 | <.0001 | 1.829 | 1.166 | 2.868 | 0.009 |
| Year | | | | | | | | |
| 2011 | 1.132 | 0.959 | 1.337 | 0.142 | 1.883 | 1.337 | 2.652 | 0.000 |
| 2012 | 1.298 | 1.112 | 1.517 | 0.001 | 1.628 | 1.159 | 2.286 | 0.005 |
| 2013 | 1.067 | 0.912 | 1.248 | 0.418 | 1.278 | 0.896 | 1.821 | 0.175 |
| 2014 | 1.108 | 0.957 | 1.282 | 0.169 | 1.326 | 0.954 | 1.842 | 0.093 |
| 2015 | 1.000 | | | | 1.000 | | | |

Table 3 demonstrates the results of a stratified analysis of the effect of overtreatment on the degree of recovery and satisfaction depending on whether the selective treatment was recommended. Compared to the group who answered ‘not at all’ about overtreatment, the degree of recovery in the group who responded ‘very much so’ and who received the recommendation for selective treatment was 5.553 times (OR: 5.553, 95% CI: 1.135- 27.175, P-value: 0.034), and satisfaction was found to be 271.375 times lower (OR: 261.375, 95% CI: 19.350-3805.870, P-value <0.001). The degree of recovery of the group not recommended for elective treatment was found to be negative by 2.775 times (OR: 2.775, 95% CI: 1.068-7.205, P-value: 0.036), and the satisfaction level was 26.656 times lower (OR: 26.656, 95% CI: 95% CI: 1.068-7.205). 9.836-72.240, P-value <0.001).

**Table 3.** Adjusted effect between Overtreatment and Non-Recovery or Unsatisfaction by Premium Treatment advice

| | Non-Recovery | | | | | | | | Unsatisfaction | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OR | 95%CI | | P-value | OR | 95%CI | | P-value | OR | 95%CI | | P-value | OR | 95%CI | | P-value |
| | Premium Treatment advice (Yes) | | | | Premium Treatment advice (No) | | | | Premium Treatment advice (Yes) | | | | Premium Treatment advice (No) | | | |
| Overtreatment in medical facility | | | | | | | | | | | | | | | | |
| Very Probable | 5.553 | 1.135 | 27.175 | 0.034 | 2.775 | 1.068 | 7.205 | 0.036 | 271.375 | 19.350 | 3805.870 | <.0001 | 26.656 | 9.836 | 72.240 | <.0001 |
| Probable | 2.274 | 1.059 | 4.883 | 0.035 | 2.201 | 1.584 | 3.059 | <.0001 | 18.366 | 2.153 | 156.695 | 0.008 | 3.424 | 1.984 | 5.907 | <.0001 |
| Moderate | 2.067 | 1.152 | 3.709 | 0.015 | 1.950 | 1.570 | 2.421 | <.0001 | 7.766 | 1.002 | 60.196 | 0.050 | 2.104 | 1.367 | 3.237 | 0.001 |
| Probably not | 1.720 | 1.005 | 2.943 | 0.048 | 1.531 | 1.280 | 1.831 | <.0001 | 3.710 | 0.488 | 28.216 | 0.205 | 0.952 | 0.642 | 1.411 | 0.806 |
| Not at all | 1.000 | | | | 1.000 | | | | 1.000 | | | | 1.000 | | | |
| non-reimbursement (10,000WON) | | | | | | | | | | | | | | | | |
| 0 | 1.000 | | | | 1.000 | | | | 1.000 | | | | 1.000 | | | |
| 1-24 | 0.804 | 0.375 | 1.726 | 0.576 | 1.043 | 0.873 | 1.245 | 0.644 | 1.186 | 0.266 | 5.290 | 0.823 | 1.461 | 0.971 | 2.199 | 0.069 |
| 25-49 | 0.738 | 0.343 | 1.590 | 0.438 | 1.122 | 0.909 | 1.386 | 0.285 | 1.312 | 0.298 | 5.764 | 0.720 | 1.296 | 0.800 | 2.100 | 0.292 |
| 50-99 | 0.909 | 0.434 | 1.904 | 0.800 | 1.148 | 0.926 | 1.423 | 0.209 | 1.013 | 0.241 | 4.254 | 0.986 | 1.333 | 0.819 | 2.169 | 0.248 |
| Over 100 | 0.862 | 0.416 | 1.783 | 0.688 | 1.556 | 1.249 | 1.939 | <.0001 | 0.672 | 0.166 | 2.719 | 0.577 | 1.371 | 0.835 | 2.251 | 0.212 |
| Premium Treatment advice / use | | | | | | | | | | | | | | | | |
| Yes/Yes | 1.000 | | | | | | | | 1.000 | | | | | | | |
| Yes/No | 1.461 | 0.785 | 2.717 | 0.231 | | | | | 0.852 | 0.249 | 2.909 | 0.798 | | | | |
| No/Yes | | | | | 1.000 | | | | | | | | 1.000 | | | |
| No/No | | | | | 0.965 | 0.812 | 1.147 | 0.686 | | | | | 0.994 | 0.695 | 1.420 | 0.972 |
| Hospitalization decision | | | | | | | | | | | | | | | | |
| Medical staff | 1.104 | 0.549 | 2.219 | 0.781 | 1.245 | 1.025 | 1.512 | 0.027 | 1.032 | 0.227 | 4.698 | 0.967 | 1.283 | 0.809 | 2.033 | 0.290 |
| Myself | 1.000 | | | | 1.000 | | | | 1.000 | | | | 1.000 | | | |
| Other | 0.307 | 0.057 | 1.671 | 0.172 | 2.357 | 1.600 | 3.472 | <.0001 | 5.181 | 0.583 | 46.044 | 0.140 | 1.540 | 0.704 | 3.367 | 0.279 |
| Sex | | | | | | | | | | | | | | | | |
| Male | 1.000 | | | | 1.000 | | | | 1.000 | | | | 1.000 | | | |
| Female | 1.250 | 0.935 | 1.670 | 0.132 | 0.927 | 0.830 | 1.035 | 0.177 | 0.867 | 0.485 | 1.550 | 0.630 | 0.827 | 0.655 | 1.044 | 0.110 |
| Age | | | | | | | | | | | | | | | | |
| Under 19 | 1.000 | | | | 1.000 | | | | 1.000 | | | | 1.000 | | | |
| 20-29 | 1.177 | 0.452 | 3.067 | 0.738 | 1.951 | 1.399 | 2.721 | <.0001 | 1.554 | 0.127 | 18.997 | 0.730 | 0.643 | 0.288 | 1.433 | 0.280 |
| 30-39 | 0.930 | 0.434 | 1.992 | 0.851 | 2.160 | 1.634 | 2.857 | <.0001 | 5.135 | 0.927 | 28.443 | 0.061 | 0.789 | 0.431 | 1.442 | 0.440 |
| 40-49 | 1.940 | 1.009 | 3.732 | 0.047 | 3.399 | 2.614 | 4.420 | <.0001 | 3.578 | 0.653 | 19.594 | 0.142 | 1.148 | 0.679 | 1.940 | 0.607 |
| 50-59 | 1.997 | 1.066 | 3.743 | 0.031 | 3.449 | 2.688 | 4.426 | <.0001 | 2.355 | 0.420 | 13.214 | 0.331 | 1.201 | 0.738 | 1.953 | 0.461 |
| Over 60 | 1.982 | 1.141 | 3.444 | 0.015 | 4.763 | 3.815 | 5.947 | <.0001 | 4.410 | 0.965 | 20.148 | 0.056 | 1.579 | 1.049 | 2.376 | 0.029 |
| Region | | | | | | | | | | | | | | | | |
| Seoul | 0.875 | 0.566 | 1.352 | 0.546 | 1.199 | 0.989 | 1.452 | 0.064 | 0.514 | 0.191 | 1.385 | 0.188 | 0.988 | 0.646 | 1.511 | 0.956 |
| Metropolitan | 1.029 | 0.736 | 1.438 | 0.868 | 1.015 | 0.897 | 1.149 | 0.808 | 0.765 | 0.390 | 1.500 | 0.435 | 1.224 | 0.950 | 1.578 | 0.117 |
| Rural | 1.000 | | | | 1.000 | | | | 1.000 | | | | 1.000 | | | |
| Type of hospital | | | | | | | | | | | | | | | | |
| Tertiary hospital | 0.778 | 0.275 | 2.204 | 0.637 | 0.971 | 0.779 | 1.211 | 0.795 | 0.826 | 0.154 | 4.441 | 0.824 | 0.920 | 0.576 | 1.469 | 0.726 |
| Secondary hospital | 0.839 | 0.299 | 2.353 | 0.739 | 0.959 | 0.829 | 1.110 | 0.575 | 0.593 | 0.111 | 3.153 | 0.540 | 0.945 | 0.686 | 1.303 | 0.731 |
| Other medical institutions | 1.000 | | | | 1.000 | | | | 1.000 | | | | 1.000 | | | |

| | Non-Recovery | | | | | | | | Unsatisfaction | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OR | 95%CI | | P-value | OR | 95%CI | | P-value | OR | 95%CI | | P-value | OR | 95%CI | | P-value |
| | Premium (Yes) Treatment advice | | | | Premium (No) Treatment advice | | | | Premium (Yes) Treatment advice | | | | Premium (No) Treatment advice | | | |
| Hospitalization days | | | | | | | | | | | | | | | | |
| 1-7 | 1.000 | | | | 1.000 | | | | 1.000 | | | | 1.000 | | | |
| 8-14 | 1.600 | 1.122 | 2.282 | 0.010 | 1.159 | 1.008 | 1.332 | 0.039 | 1.220 | 0.576 | 2.585 | 0.603 | 1.388 | 1.037 | 1.858 | 0.028 |
| 15-21 | 3.107 | 1.792 | 5.387 | <.0001 | 2.171 | 1.790 | 2.633 | <.0001 | 1.638 | 0.568 | 4.718 | 0.361 | 1.679 | 1.149 | 2.453 | 0.008 |
| 22-28 | 5.842 | 2.440 | 13.984 | <.0001 | 2.270 | 1.673 | 3.078 | <.0001 | 4.580 | 1.406 | 14.917 | 0.012 | 1.860 | 1.081 | 3.200 | 0.025 |
| Over 29 | 2.584 | 1.329 | 5.024 | 0.005 | 2.950 | 2.248 | 3.871 | <.0001 | 1.397 | 0.379 | 5.150 | 0.616 | 1.922 | 1.187 | 3.113 | 0.008 |
| Year | | | | | | | | | | | | | | | | |
| 2011 | 0.657 | 0.411 | 1.050 | 0.079 | 1.250 | 1.045 | 1.495 | 0.015 | 1.318 | 0.525 | 3.306 | 0.556 | 2.027 | 1.399 | 2.936 | 0.000 |
| 2012 | 1.337 | 0.855 | 2.090 | 0.204 | 1.282 | 1.085 | 1.515 | 0.004 | 1.492 | 0.608 | 3.665 | 0.383 | 1.637 | 1.130 | 2.370 | 0.009 |
| 2013 | 1.013 | 0.649 | 1.581 | 0.956 | 1.082 | 0.914 | 1.280 | 0.359 | 1.079 | 0.432 | 2.699 | 0.870 | 1.293 | 0.878 | 1.904 | 0.194 |
| 2014 | 1.324 | 0.841 | 2.084 | 0.226 | 1.089 | 0.933 | 1.272 | 0.280 | 0.737 | 0.261 | 2.080 | 0.565 | 1.410 | 0.994 | 2.000 | 0.054 |
| 2015 | 1.000 | | | | 1.000 | | | | 1.000 | | | | 1.000 | | | |

In the group that answered ‘mostly yes’ to whether excessive treatment was made, the degree of recovery in the group who received the recommendation for elective treatment was negative by 2.274 times (OR: 2.274, 95% CI: 1.059-4.883, P-value: 0.035), while satisfaction was found to be 18.366 times lower (OR: 18.366, 95% CI: 2.153-156.695, P-value: 0.008). The degree of recovery of the group not recommended for elective treatment was 2.201 times (OR: 2.201, 95% CI: 1.584-3.059, P-value <0.001), and the satisfaction level was 3.424 times (OR: 3.424, 95% CI: 1.584-3.059, 95% CI: 1.984-5.907, P-value <0.001) was investigated to be low. Among the groups who answered ‘so so’ about excessive treatment, the degree of recovery of the group who received the recommendation for elective treatment was 2.067 times (OR: 2.067, 95% CI: 1.152-3.709, P-value: 0.015) negative, while satisfaction was found to be 7.766 times lower (OR: 7.766, 95% CI: 1.002-60.196, P-value: 0.050). Furthermore, the recovery degree of the group not recommended for elective treatment was found to be negative by 1.950 times (OR: 1.950, 95% CI: 1.570-2.421, P-value <0.001), and satisfaction was 2.104 times lower (OR: 2.104, 95%). CI: 1.367-3.237, P-value: 0.001).

## 4. Discussion

This study sough to find out the relationship between overtreatment by medical institutions, patient recovery and satisfaction by using the 10th Korea Health Panel Survey (KHPS), which surveyed household members living in 16 cities and provinces nationwide. With the rapid increase in the proportion of the elderly in Korea, medical expenses (Ministry of Health and Welfare, 2021) and the number of visits to medical institutions (Ministry of Health and Welfare, 2021) also increase, reducing the burden of national medical finance by suppressing overtreatment domestically and internationally. A study (Ministry of Health and Welfare & Seoul National University, 2000) and a simple investigation into the relationship between overtreatment and patient satisfaction with medical institutions (Ministry of Health and Welfare & Seoul National University, 2000) are in progress.

However, the previous studies conducted on the relationship between overtreatment and individual patient's recovery and satisfaction have not been conducted, and most of the studies on national medical finance due to overtreatment (Hadler, 2007) and previous studies on the causes of overtreatment (Bae, 2014; Cheong & Lee, 2017; KOSIS, 2021; Lee & Lee, 2016; You & Kwon, 2012) are in progress. Hence, this study went further than previous studies and analyzed the correlation by analyzing whether there was excessive treatment for patients inpatients in domestic medical institutions, the patient's recovery degree, and the patient's satisfaction with medical institutions, and based on which, it is intended to provide policy and institutional basis data for improving the degree of recovery and satisfaction of the group that is determined to be receiving excessive medical services compared to other groups.

The summary of the research results is as follows. The degree of recovery and satisfaction of the group that responded 'very much' about the overtreatment or not was found to be more negative than that of the group that responded 'not at all'. Furthermore, it was found that the degree of recovery and satisfaction of patients deteriorated as the level of awareness that the recommended group received excessive medical treatment increased compared to the group not recommended for selective treatment.

According to the previous studies (Han, 2019; National Health Insurance Service, 2019), overtreatment is widely provided not only in Korea but also abroad, and overtreatment in Korea progresses along with rapid population aging, which has a fatal impact on health insurance financial deterioration. (Lee, 2001). In addition to which, it has been investigated that additional radiation treatment provided in the course of overtreatment has adverse effects on patient health (Cheong & Park, 2016). According to Welch's preceding study (Welch & Black, 2010), patients had to undergo unnecessary tumor examination using radiation medical devices such as CT even though they had simple mild diseases, and the adverse effects on personal health due to radiation exposure and time and it may be assumed that the cause of the result of this study is that the overall satisfaction with the medical institution is lowered due to the increase in cost. Furthermore, the continuously increasing elderly group has lower expectations for self-recovery than other groups, and undergoes additional radiation therapy in the process of physiological degeneration, resulting in changes in internal organs and tissues, further resulting in a higher degree of negative recovery (Chun & Cho, 2011).

It has been demonstrated that overprescription of medicines, which is a representative excessive medical service along with radiation treatment, is made due to the pursuit of profits by medical institutions and measures for reliable treatment of patients (Vakili-Arki et al., 2019). As a result, compared to other groups, the patients who received overprescription demonstrated decreased viral resistance (Vakili-Arki et al., 2019), decreased recovery rate (Cheong & Park, 2016), and decreased satisfaction with medical institutions (Park et al., 2015) was investigated. In addition to which, according to a preceding study by the Korea Consumer Agency (Agency, 2014), increased medical expenditure due to overtreatment was found to be the 4th item with the greatest economic burden among 18 items of household expenditure. It was found that burden can cause a decrease in satisfaction with medical institutions and a decrease in recovery speed (Agency, 2014; Cheong & Park, 2016). Hence, the results of this study that the higher the degree of overtreatment, the lower the patient's recovery and satisfaction with medical institutions were consistent with the previous

domestic and foreign studies.

Furthermore, in the case of a study showing that the higher the awareness of excessive medical care in the group receiving the recommendation for selective treatment, the lower the degree of recovery and satisfaction. It is recommended to patients with diseases and has a positive function of allowing patients to choose a doctor, but since all expenses other than the treatment fee are borne by the patient, it is considered an important factor in recognizing overtreatment and has a great impact on the recovery and satisfaction of patients. (Agency, 2014; Han, 2019). Furthermore, according to a previous study in Korea (Lm, 2014), the satisfaction level of the group who had been recommended and used elective treatment was quite low, and the cause of it was investigated by the awareness of high cost and information asymmetry, and selective treatment itself caused high cost burden and medical information asymmetry, which is the main cause of excessive medical care, and as shown in the results of this study, excessive medical treatment in the group recommended for selective treatment, and it is thought that the stronger the awareness of, the lower the degree of satisfaction and recovery (Lm, 2014).

Hence, this study aimed at the group determined to be receiving excessive medical care and furthermore, the group who was recommended for elective treatment, so that the institutional standards for providing appropriate medical care and sufficient explanation of the medical services provided through medical institutions were provided to the group. If provided, it is predicted that not only the improvement of individual mental and physical health, but also the degree of recovery of patients and satisfaction with medical institutions may be increased.

The limitations of this study are, first, it is entirely defined as subjective overmedical treatment because there is no appropriate index to determine whether there is overmedical treatment. Second, the medical panel used in this study has subjective bias due to the fact that respondents' views are mixed. Hence, it is necessary to understand the research results while acknowledging the objectivity of self-report data. Finally, although the analysis was performed using the Korea Health Panel, which is a longitudinal data, it can reflect the inverse causal relationship between excessive medical care and patient recovery and satisfaction. Despite such limitations, this study has the following strengths. The Korea Health Panel used in this study offers the advantage of representing the entire population of survey participants, so it may be generalized to patients who have experienced hospitalization in Korea. Furthermore, a study was conducted on the effect of overmedical treatment care on patient satisfaction and recovery in a situation where research on overmedical treatment care was not active, and furthermore, stratified whether to recommend selective treatment system, which accounts for the main share of overmedical treatment care, as a matter of the strength of conducting a detailed analysis.

## 5. Conclusion

In this study, based on the 6th to 10th Korea Health Panel, which was a follow-up survey of domestic residents of all ages, the effect of overtreatment by medical institutions on patients' health satisfaction and recovery was studied. As a result of the study, the stronger the awareness of

overtreatment, the higher the patient's dissatisfaction and discomfort, and a particularly strong correlation was found in the group recommended for selective treatment. Hence, if the institutional standards for providing appropriate medical care to the group experiencing excessive medical treatment through the medical institutions and sufficient explanations about the medical services provided to the patients are provided, the satisfaction and recovery of patients will increase, and it is also expected to be used as the basic data for preparing policy and institutional measures towards that end.

## Conflicts of Interest

The authors declare no conflict of interest.

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