A Study on the Decision-Making of Patients' Non-hospitalization Behavior

Qing-Shun LIU¹,a, Li-Li LI²,b,* and Ying SHAO³,c

¹Shandong Youth University of Political Science, Jinan, Shandong, China
²Shandong University of Technology, Zibo, Shandong, China
³Shandong University of Finance and Economics, Jinan, Shandong, China

a lqs2003@126.com, b sdlili2014@163.com, c shaoying_sdufe@163.com

*Corresponding author

Abstract. The phenomenon of "expensive seeking doctor" not only brings great physical and psychological pressure and economic burden to the patient, but also enlarges the anxiety, the suspicion, the fear and the non-rational medical treatment. Based on the data of "China Health and Retirement Longitudinal Study", the paper found that there was no significant effect on the choice behavior of "doctor suggested hospitalization but not" by the sex, age, marital status and etc. However, the relationship between the satisfaction of medical service, the self-assessment health status and the health satisfaction was positively related to the degree of regular pain and self-feeling depression. Moreover the effect of self-assessment health status and regular body pain is the most effective, and the degree of self-feeling depression is the least.

Introduction

At present, the phenomenon of "difficult and expensive to see a doctor" is still quite common, which not only brings great physical and mental pressure and economic burden to patients, but also magnifies patients' anxiety, suspicion and fear, as well as irrational medical treatment behavior, and brings more and more doctor-patient disputes. This, in turn, changes the irrational behavior of doctors-allowing patients to do more tests, sometimes not to generate income, but to leave material evidence for treatment; over-medication is sometimes not what the doctor wants, but what the patient expects to do. Generally speaking, everyone thinks that their behavior and decision-making are very rational and in line with their own principle of maximizing utility, but in fact they are often smart fools [1]. Therefore, the patient's "smart fool" decision-making behavior has a certain systematic and psycho-social basis, and sometimes it is not linear with the reform of the medical system. Based on the follow-up data of China Health and Retirement Longitudinal Study (CHARLS), the paper discusses the phenomenon that "doctors suggest that patients should be hospitalized but not hospitalized", reveals the rational degree and rational choice of people's decision-making on medical treatment behavior, and provides countermeasures and suggestions for the reform of medical security system in China.

Theoretical Analysis and Variable Selection

Medical treatment behavior is also very subjective, such as whether to see a doctor, when to see a doctor, where to see a doctor and so on, most of them make choices according to their own situation. Of course, for infants, children, elderly or completely incapacitated people, the choice of medical treatment is made by the family or others. Therefore, the object of this study mainly refers to the patients who make their own choice of medical behavior.

The behavior of seeking medical treatment in a broad sense refers to any behavior of seeking health status, while the behavior of seeking medical treatment in a narrow sense refers to going to a special
medical institution to seek medical rehabilitation. This study refers to the narrow sense of medical treatment behavior, that is, the active action taken by the patient to confirm the existence of the disease and seek to alleviate the pain of the disease, the concept, performance and action of seeking medical help when he feels uncomfortable or has some symptoms of the disease, or even if he does not feel uncomfortable now, "[2]. Andersen 's health service utilization model believes that [3] People's use of medical services is the result of their tendencies, abilities and demand factors. Among them, the tendency factors include demographic statistical characteristics, social structure and health belief variables; ability factors include income, medical insurance, availability and accessibility of medical and health resources, and demand factors refer to the symptoms of diseases experienced by people, pain and concern about health status. That is to say, under the condition of "demand", propensity and ability constitute the conditions for people to decide whether to seek health services or not.

The heuristic decision-making and deviation of patients and doctors [4]. This paper mainly discusses the effects of imagination, trust, emotional prediction, scene selection and other psychological processes on patients' medical treatment behavior and doctor's treatment behavior. Some studies have pointed out that there is no irrational deviation in the treatment of patients because of the sinking of a certain amount of time or money. The uncertainty of health and the widespread representative deviation, conformity psychology, loss aversion, psychological account, regret aversion and so on are the important reasons why people do not succeed in changing unhealthy behavior [6]. The grass-roots medical treatment behavior of middle-aged and elderly groups in urban and rural areas is affected by many factors, such as individual characteristics, family characteristics, characteristics of medical institutions, medical expenditure, medical security and other multidimensional factors [7]. The factors affecting residents' choice of medical institutions are complex and diverse. Five factors, such as the level of medical institutions, the economic situation, the soft power of medical institutions, the social relationship network and the distance from medical treatment, are the main influencing factors [8]. The factors that affect the choice of rural residents' outpatient institutions and inpatient institutions are not completely the same. Sex, age and other characteristics have no significant effect on the choice of outpatient treatment institutions and hospitalization institutions of rural residents. Educational level, family income, distance of medical institutions, doctor level, medical equipment, reasonable degree of charge and compensation standard have significant influence on the choice of outpatient institutions and inpatient institutions of rural residents [2].

This study mainly discusses the phenomenon that "doctors think they should be hospitalized but not hospitalized in the past year" and "what are the reasons for not hospitalization". The influencing variables include local medical service perception, self-perceived health endowment, self-perceived physical condition, self-assessment of physical condition, health satisfaction, life satisfaction, child relationship satisfaction, amount of cash at home, whether the body often feels pain, etc., control variables include sex, age, Marital status, type of residence, etc.

Data Collation and Statistical Analysis

The China Health and Retirement Longitudinal Study, a set of high-quality micro-data representing families and individuals aged 45 and over in China, was conducted in 2011 and covers 17,000 out of 10,000 families at the county level and at the village level. The samples, which have been followed up every two years, are based on 2015 national follow-up data, which were released by Peking University in 2017.

Analysis of Demographic Characteristics

The preliminary demographic variable analysis showed that the age distribution of the sample was 36 times 75 years old, the residence type was concentrated in the village, and the marriage type was concentrated in married and living with the spouse. Therefore, in order to facilitate statistical analysis
and explanation, the age group was divided into four groups, namely 36-45 years, 46-55 years, 56-65 years, and 66-75 years. Secondly, the types of residence are divided into towns and villages. Among them, the cities and towns include the main urban area (N=2950), the urban and rural area (N=974), the town center area (N=1084), the town township area (N=564), the special area (N=84), the township center area (N=282). In addition, marital status is divided into cohabitation with spouse and cohabitation without spouse. Among them, cohabitation with a spouse includes married living with a spouse (N=16985), cohabitation without a spouse (N=26), while cohabitation without a spouse includes separation, divorce, widowhood, never married and married but not living with a spouse because of work. The sorted variables are as follows:

Table 1. Frequency Statistics of Sample Age Group.

| Age Group    | Frequency | Percentage | Valid percentage | Cumulative percentage |
|--------------|-----------|------------|------------------|-----------------------|
| Valid 36-45 years | 1515      | 7.2        | 8.1              | 8.1                   |
| Valid 46-55 years | 6734      | 31.9       | 36.0             | 44.1                  |
| Valid 56-65 years | 6512      | 30.9       | 34.8             | 78.9                  |
| Valid 66-75 years | 3952      | 18.7       | 21.1             | 100.0                 |
| Total        | 18713     | 88.7       | 100.0            |                       |

Table 2. Frequency Statistics of Residence and Marriage Type.

| Residence/Type   | Frequency | Percentage | Frequency | Percentage |
|------------------|-----------|------------|-----------|------------|
| Valid City/town  | 5938      | 28.1       | 17011     | 80.6       |
| Valid Village    | 14474     | 68.6       | 4049      | 19.2       |
| Total            | 20412     | 96.7       | 21060     | 99.8       |
| Missing System   | 689       | 3.3        | 41        | .2         |
| Total            | 21101     | 100.0      | 21101     | 100.0      |

As can be seen from tables 1 and 2, the age of the sample is further concentrated in the ages of 46-55 and 56-55, while the type of place of residence and the type of marriage are still concentrated in "village" and "cohabitation with spouse". The frequency of dependent variables was shown in Table 3. Only 5.6% of the patients (N=20876) who thought they should be hospitalized but not staying in the past year, but 3.0% of them chose "no money" among the "reasons for no hospitalization" (N =1214), accounting for the largest proportion. However, is it reluctant to spend money for fear of poverty as a result of illness? Or is there absolutely no money?

Table 3. Frequency Statistics.

| Reason of non-hospitalization | Frequency | Percentage | Frequency | Percentage | Valid | Missing |
|-------------------------------|-----------|------------|-----------|------------|-------|---------|
| doctor suggested hospitalization but not | Yes 1186 | 5.6        | No 19690  | 93.3       | 20876 | 225     |
| Reason of non-hospitalization | Not enough money 638 | 3.0 | Unlikely to cure problem too serious 27 | 0.1 | 1214 | 19887 |
Binary Logistic Regression Analysis of Non-hospitalization Selection

The binary Logistic regression was used to analyze the binary variable "whether or not to choose hospitalization". The classified variables entering the equation include sex, marital status, type of residence, frequent physical pain, commercial endowment insurance, covariables including age, amount of cash at home, participation or receipt of commercial old-age insurance, satisfaction with local medical services, self-assessment of health status, self-assessment of health endowment, self-assessment of life expectancy, self-assessment of memory, degree of self-depression, health satisfaction, marital satisfaction, Children's relationship satisfaction, life satisfaction. The encoding of the classification variables is shown in Table 4:

Table 4. Categorical Variables Codings.

| Variable                                | Frequency | Parameter coding | (1)  | (2)  |
|-----------------------------------------|-----------|------------------|------|------|
| Participate or receive commercial endowment insurance | 1 Participate But Not Receive | 42   | 1.000 | .000 |
|                                          | 2 Participate and Receive     | 7    | .000  | 1.000|
|                                          | 3 Not Participate and Receive | 5383 | .000  | .000 |
| Marital status                          | 1 Cohabitation with a spouse  | 5101 | 1.000 |      |
|                                          | 2 Cohabitation without spouse | 331  | .000  |      |
| Sex                                     | 1 Male                                 | 2876 | 1.000 |      |
|                                          | 2 Female                                | 2556 | .000  |      |
| Type of the address                     | 1 City/town                             | 1659 | 1.000 |      |
|                                          | 2 Village                               | 3773 | .000  |      |
| Frequent body pain                      | 1 Yes                                  | 1454 | 1.000 |      |
|                                          | 2 No                                   | 3978 | .000  |      |

It can be seen from Table 4 that up to 99.10% (N=5432) of the patients do not participate in or receive commercial old-age insurance, which reflects the economic level of the patients and the ability to seek medical treatment. In addition, 26.77% of the patients were annoyed by frequent physical pain. However, do these variables have a statistical effect on the choice of "whether or not to stay in hospital"? The model verification is as follows:

Table 5. Variables in the Equation.

| Step | B     | S.E.  | Wald  | df  | Sig.  | Exp(B) |
|------|-------|-------|-------|-----|-------|--------|
| 0    | B     | S.E.  | Wald  | df  | Sig.  | Exp(B) |
|      | 2.829 | .059  | 2289.607 | 1   | .000  | 16.927 |

It can be seen from Table 5 that the constant term of the original model is positive value, B is 2.829, and the standard error is 0.059, while the wald-square test value equal to (B/S.E)^2 and (2.829/0.059)^2 equal to 2299.121, which is almost close to 2289.607 in the table, is due to the downward rounding of our data, so the data will be slightly smaller. B and Exp (B) are logarithmic relations, and the p value
after conversion is very significant, which means that the regression equation has statistical
significance. In addition, it can be seen from the "variables not in the equation" that the variables that
were not tested were self-perceived health endowment (p =0.122), participation in or receipt of
commercial old-age insurance (p =0.232), type of residence (p =0.333), and marital status (p =0.718).
After removing these variables, the regression analysis was performed again, and the results of the
model tests are shown in Table 6:

Table 6. Omnibus Test of Model Coefficients and Model Summary.

| Step  | -2 Log Likelihood | Cox & Snell R² | Nagelkerke R² | Chi-square | df | Sig. |
|-------|-------------------|---------------|---------------|------------|----|------|
| Step 1| 2174.016<sup>a</sup> | .030          | .085          | 163.87     | 1  | .000 |
|       | Block             |               |               | Model      |    |      |
|       | Step              |               |               | 163.87     | 1  | .000 |
|       | Model             |               |               | 163.87     | 1  | .000 |
| Step 2| 2050.680<sup>b</sup> | .052          | .147          | 287.21     | 2  | .000 |
|       | Block             |               |               | Model      |    |      |
|       | Step              |               |               | 287.21     | 2  | .000 |
|       | Model             |               |               | 287.21     | 2  | .000 |
| Step 3| 2029.096<sup>b</sup> | .055          | .158          | 308.79     | 3  | .000 |
|       | Block             |               |               | Model      |    |      |
|       | Step              |               |               | 308.79     | 3  | .000 |
|       | Model             |               |               | 308.79     | 3  | .000 |
| Step 4| 2017.439<sup>b</sup> | .057          | .164          | 320.45     | 4  | .000 |
|       | Block             |               |               | Model      |    |      |
|       | Step              |               |               | 320.45     | 4  | .000 |
|       | Model             |               |               | 320.45     | 4  | .000 |
| Step 5| 2029.096<sup>b</sup> | .059          | .167          | 327.62     | 5  | .000 |
|       | Block             |               |               | Model      |    |      |
|       | Step              |               |               | 327.62     | 5  | .000 |
|       | Model             |               |               | 327.62     | 5  | .000 |

<sup>a</sup> Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.
<sup>b</sup> Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

Table 7. Hosmer and Lemeshow Test.

| Step | Chi-square | df | Sig. |
|------|------------|----|------|
| 1    | .000       | 0  | .    |
| 2    | 14.407     | 4  | .006 |
| 3    | 8.578      | 6  | .199 |
| 4    | 8.751      | 8  | .364 |
| 5    | 13.110     | 8  | .108 |

Table 8. Contingency Table for Hosmer and Lemeshow Test.

|      | Suggested hospitalization but not =Yes | Suggested hospitalization but not =No |
|------|--------------------------------------|--------------------------------------|
|      | Observed    | Expected    | Observed    | Expected    | Total |
| Step 1| 105           | 117.290     | 439         | 426.710     | 544   |
| 5    | 2             | 65           | 59.434      | 478         | 483.566 | 543   |
|      | 3             | 52           | 37.307      | 491         | 505.693 | 543   |
|      | 4             | 29           | 25.525      | 514         | 517.475 | 543   |
|      | 5             | 19           | 19.022      | 529         | 528.978 | 548   |
|      | 6             | 12           | 15.671      | 532         | 528.329 | 544   |
|      | 7             | 9            | 13.011      | 534         | 529.989 | 543   |
As can be seen from Table 6, with the gradual progress of the model, the chi-square value is getting larger and larger, which indicates that the model is becoming more and more significant. Moreover, the fitting effect of Cox-Snell $R^2$ and Nagelkerke $R^2$ is not ideal, and the final ideal model is only 0.059 and 0.167. However, the logarithmic values of the maximum likelihood square are relatively large, which is obviously significant.

Combining Hosmer & Lemeshow test and its column table, we can see from Table 7 that after five iterations, the final chi-square statistics are 13.110 and P value is 0.108 > 0.05, which shows that the model can fit the whole well. Moreover, it can be seen from Table 8 that the observed values are almost close to the expected values, and there is no great difference, which indicates that the fitting effect of the model is ideal, which confirms the results of Hosmer & Lemeshow test.

Table 9. Model If Term Removed.

| Variable                          | Model Log Likelihood | Change in -2 Log Likelihood | df | Sig. of the Change |
|-----------------------------------|----------------------|-----------------------------|----|--------------------|
| Step 1 Frequent body pain         | -1168.946            | 163.875                     | 1  | .000               |
| Step 2 Self-assessment health status | -1087.008          | 123.336                     | 1  | .000               |
| Frequent body pain                | -1049.473            | 48.267                      | 1  | .000               |
| Step 3 Self-assessment health status | -1048.576          | 68.055                      | 1  | .000               |
| Frequent body pain                | -1032.835            | 36.575                      | 1  | .000               |
| Health satisfaction               | -1025.340            | 21.584                      | 1  | .000               |
| Step 4 Self-assessment health status | -1036.852          | 56.265                      | 1  | .000               |
| Frequent body pain                | -1020.439            | 23.440                      | 1  | .000               |
| Degree of self-depression         | -1014.548            | 11.657                      | 1  | .001               |
| Health satisfaction               | -1015.590            | 13.741                      | 1  | .000               |
| Step 5 Medical service satisfaction | -1008.720          | 7.176                       | 1  | .007               |
| Self-assessment health status      | -1033.217            | 56.171                      | 1  | .000               |
| Frequent body pain                | -1017.124            | 23.985                      | 1  | .000               |
| Degree of self-depression         | -1010.663            | 11.062                      | 1  | .001               |
| Health satisfaction               | -1010.464            | 10.664                      | 1  | .001               |

Table 10. Variables in the Equation (The First Four Steps Are Omitted).

|                      | B  | S. E. | Wald | df | Sig. | Exp(B) |
|----------------------|----|-------|------|----|------|--------|
| Step 5 Medical service satisfaction | .155 | .058  | 7.172 | 1  | .007 | 1.168  |
| Step 5 Self-assessment health status | .778 | .112  | 48.011 | 1 | .000 | 2.178  |
| Frequent body pain    | -.690 | .142  | 23.782 | 1 | .000 | .501   |
| Degree of self-depression | -.033 | .010  | 11.216 | 1 | .001 | .967   |
| Health satisfaction   | .254  | .079  | 10.383 | 1 | .001 | 1.290  |
| Constant              | 1.174 | .395  | 8.818 | 1  | .003 | 3.235  |

As can be seen from Table 9, no matter which independent variable is removed, the "significance of change" is very small, almost all less than 0.05, so these independent variable coefficients are significantly related to the model and cannot be deleted. According to Table 10, the expression of
logistic regression model was $P(Y) = \frac{1}{1 + e^{-(1.174 + 0.155 \times \text{medical service satisfaction} + 0.778 \times \text{self-assessment health status} - 0.690 \times \text{frequent body pain} - 0.033 \times \text{degree of self-depression} + 0.254 \times \text{Health satisfaction})}}$. This means that the medical choice behavior that doctors think should be hospitalized without hospitalization is positively correlated with medical service satisfaction, self-assessment of health status and health satisfaction, but negatively correlated with frequent physical pain and the degree of self-perceived depression. Among them, self-assessment of health status (0.778) and frequent body pain (-0.690) had the greatest effect, and the degree of self-perceived depression (-0.033) had the least effect, which also indicated that depression, a chronic disease, rarely had hospitalization behavior.

In addition, it can be seen from the "variables that are not in the equation" that the variables that are not included in the model include sex ($p = 0.471$), age ($p = 0.298$), marital status ($p = 0.174$), type of residence ($p = 0.192$), amount of cash in the family ($p = 0.070$), self-perceived health endowment ($p = 0.975$), self-estimated life expectancy ($p = 0.063$), self-rated memory ($p = 0.932$), marital satisfaction ($p = 0.745$), Child relationship satisfaction ($p = 0.184$), life satisfaction ($p = 0.511$), commercial old-age insurance ($p = 0.374$). It is obvious that the $p$ values are greater than 0.05, which indicates that these independent variables are not significantly correlated with the model. Compared with outpatient behavior, these factors often have little impact on hospitalization behavior, because most of the inpatients are severe, emergency, difficult symptoms and other phenomena, which have little to do with these variables.

Conclusions and Prospects

Based on the data of China Health and Retirement Longitudinal Study, the paper mainly discusses the main characteristics and laws that affect the hospitalization behavior of middle-aged and elderly people (36-75 years old) in China, especially the phenomenon that doctors suggest that they should stay in hospital but not stay in hospital in the past year and what are the reasons for not being hospitalized. The study found that there was no significant effect on sex, age, urban and rural distribution of residence, marital status, amount of cash in the family, self-perceived health endowment, self-estimated life expectancy, self-rated memory, marital satisfaction, child relationship satisfaction, life satisfaction, commercial pension insurance and so on. This means that compared with outpatient behavior, they often have little impact on hospitalization behavior, because most of the inpatients are severe, emergency, difficult symptoms and other phenomena, which have little to do with these variables.

However, doctors think that the behavior of medical choice that should be hospitalized without hospitalization is positively correlated with medical service satisfaction, self-assessment of health status and health satisfaction, but negatively correlated with frequent physical pain and the degree of self-perceived depression. Among them, self-assessment of health status (0.778) and frequent body pain (-0.690) had the greatest effect, and the degree of self-perceived depression (-0.033) had the least effect, which also indicated that depression, a chronic disease, rarely had hospitalization behavior. In addition, only 5.6% of the patients who thought they should be hospitalized but not staying in the past year, but 3.0% of them chose "no money" among the reasons for "no hospitalization", accounting for the largest proportion, which indicated that the phenomenon of expensive treatment was still more prominent. Irrational medical treatment behavior is more reflected in the cognitive deviation of disease, the overconfidence of disease self-healing and the restriction of economic ability, as well as the difference between urban and rural areas, and the patients living in villages are more obvious. Of course, the biggest drawback of this study is that there is no comparative analysis of outpatient behavior, non-outpatient behavior, hospitalization behavior, self-treatment and other medical decision-making behaviors, which is also one of the research topics that must be further discussed.
Acknowledgement
This research was financially supported by the Ministry of Education Humanities and Social Science Foundation (No. 13YJA630056).

References
[1]Kaiyuan Xi. Don't be a normal fool [M]. Beijing: machinery Industry Press, 2008.

[2]Zhaoyu Yao, Huihui Zhu. Factors of medical institution choice of rural residents: comparison of Outpatient and Hospitalized Medication[J]. Journal of Nanjing Agricultural University (Social Science Edition), 2014, 14 (06):52-61.

[3]Andersen R. M. Behavioral model of families’ use of health services, Research series No. 25. Chicago: Center Health Administration Studies, University of Chicago, 1968.

[4]Abraham P. Schwab. Putting cognitive psychology to work: Improving decision-making in the medical encounter[J]. Social Science & Medicine, 2008, 67: 1861–1869.

[5]Brian H. Bornsteina, A. Christine Emler, Gretchen B. Chapmanc. Rationality in medical treatment decisions: is there a sunk-cost effect[J] ? Social Science & Medicine, 1999, 49: 215-222.

[6] Qifa Gao. Effect of uncertainty and Cognitive Biases on the change of healthy behavior[J]. Chinese General Medicine, 2014, 17 (31): 3734.-3737.

[7] Xiaodan Xu, Wenqiang Wu. Analysis on the influencing factors of Primary healthcare choice in Middle-aged and elderly population based on CHARLS data [J]. China Health Policy Research, 2016, 9 (04): 23-30.

[8] Jiping Zhang, Yuqing Mi, Yijun Liu. Investigation on the choice of Medical Institution of First visit of Residents in a city in Shandong Province[J]. Medicine and Society, 2019 (07):72-75.