

The Influencing Factors of Citizens' Intention to Physical and Internet Hospitals: Sector and Privacy risk

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Abstract

COVID-19 is driving the development of Internet hospitals. However, due to the short development time of Internet hospitals, they cannot meet the different needs of patients. This paper conducted the survey experiment and provided evidence: Participants were significantly less likely to go to the hospital when the risk of privacy disclosure was higher. There was no difference in the selection of Internet hospitals and physical hospitals when participants suspected they were suffering from depression. However, participants tended to choose physical hospitals when they suspected they were suffering from physical disease.

Keywords

Physical hospital; Internet hospital; Mental health; Physical disease; Privacy risk.

1. Introduction

1.1. Research Background

In 2019, the Opinions of The State Council on the Implementation of the Healthy China Action Plan was released in China, pointing out that people's health is an important indicator of a strong and prosperous country, and giving a specific explanation of the Healthy China 2030 plan (The State Council, 2019). The new health care reform has passed more than ten years since 2009. Deepening the reform of the medical and health system not only promoted the transformation and change of physical hospitals, but also generated new forms of smart hospitals such as Internet hospitals in the process of exploration.

Internet hospital is the key of hospital innovation in the "Internet Plus" era. The public service provided by e-government developed quickly in Zhejiang province, China. Wuzhen Internet Hospital, the first Internet hospital in China, was opened by the Tongxiang Municipal government and WeDoctor enterprise in Zhejiang Province in 2015. In 2018, The State Council issued the Opinions on Promoting the Development of "Internet plus Medical And Health", providing specific policy guidelines for the integration of Internet, big data and other information technologies into the medical and health filed (The State Council, 2018). The document covered medical services, public health services, family doctors, pills supply and medical insurance settlement. Under the guidance of this document, National Health Commission of the PRC issued the Administrative Measures for Internet Hospitals (Trial) in the same year, which set out the implementation measures for Internet hospitals (National Health Commission, 2018). So far, some Internet hospitals have come out, but the number was not abundant.

In early 2020, the outbreak of COVID-19 swept the world. To avoid cross-infection in physical hospitals, online diagnosis and treatment became popular on the Internet. In March 2020, the National Medical Insurance Administration and the National Health Commission issued the Guidelines on Promoting "Internet Plus" Medical Insurance Services during COVID-19 prevention and control, promoting the progress of online medical insurance settlement (National Medical Insurance Administration & National Health Commission, 2020). In December 2020, the National Medical Insurance Administration issued a notice on Furthering the "Internet plus Medical And Health" and "Five-one" Services action, pointing out the need to promote "one-whole" sharing service, "one-code access" integrated service, "one-stop" settlement service, "one-network office" public service, and "one-game" anti-epidemic service (National Medical Insurance Administration, 2020). It can be seen that COVID-19 has significantly promoted the development of Internet hospitals. Most third-class hospitals have started to build its own Internet hospitals, which has promoted the government innovation in the field of public health.

In addition, the terrible impact of the epidemic on social life has brought anxiety to some citizens. Especially in the early days of the outbreak, the highly contagious COVID-19 struck fear into some citizens. At the same time, changes in family members and job instability exacerbated the emotion of depression, and some citizens showed some symptoms of depression. Therefore, mental health of citizens has become a hot social concern.

To sum up, the epidemic brought challenges to the mental health of citizens. Under the policy of Healthy China and the new medical reform, the ways for citizens to seek medical treatment mainly included physical hospitals and Internet hospitals. In order to avoid the risk of infection during the epidemic, it seemed that an increasing number of citizens tended to receive treatment in the department of psychiatry and psychology of Internet hospitals. However, there are differences in treatment outcomes between physical and Internet hospitals. In addition, some citizens are reluctant to seek psychological treatment because of the privacy risks. But is this the stereotype of Internet hospitals?

1.2. Research Question

The research question is the difference of citizens' intention between physical hospitals and Internet hospitals, and whether citizens' intention is affected by privacy risks. Also, I want to know whether different diseases (depression / physical disease) have different results for the selection of hospitals .

2. Literature Review

2.1. Public Health Policy

In recent public administration research, especially in the field of public health service, more and more scholars choose to carry out research by survey experiment (James et al., 2017). In addition, a study based on panel data showed that public hospital leaders made a lot of contribution to improving hospital performance (Veronesi et al., 2019).

In China, the development of the Internet and big data has broken through the restrictions of traditional public sectors and spawned the development of Internet hospitals, enabling citizens to enjoy medical services without time and space restrictions (Wang & Zhao, 2018). The "Internet Plus" policy has given a boost to the healthy China strategy. More and more citizens choose to participate in diagnosis and ordering pills on the Internet (Zhang, 2020). In addition, COVID-19 has spurred many physical hospitals to build their own Internet hospitals, basically forming the mode of combining online and offline diagnosis and treatment (Zhou, 2021).

2.2. Privacy Theory

With the development of Internet, big data and other information technologies, more and more hospitals begin to promote the informatization of health management system in hospital. Indeed, the electronic medical records and Internet hospitals have brought convenient medical services to citizens. But the risk of privacy leaks has unsettled some citizens. Based on the protection motivation theory, one study found that when the public perceives the severity of privacy risks, they will pay attention to the privacy protection of hospitals. Meanwhile, different experiences of hearing about privacy disclosure also have an impact on the awareness of privacy protection (Wu, 2020).

Public hospitals are public utilities sectors in China. Although hospitals are not administrative organizations, they also have strong authority. A study about citizens' medical information found that residents trusted the privacy protection of public hospitals more than other sectors. However, citizens were still highly sensitive to the protection of medical information privacy, and did not want their medical information to be leaked and brought inconvenience to them (Wu, 2021). Above literature provided a lot of help for this paper, but I looked for new perspective to discuss this topic.

3. Method

3.1. Participants

I conducted the 2×2 survey experiment on 335 citizens on Tencent questionnaire in Sept, 2021. Each participant received 2 yuan as bonus. 41 participants who failed to pass the manipulation check (time<50s; check; yes/no; age is wrong) were excluded from this paper. So there were 294 participants for analysis. All data was analyzed by R Studio.

3.2. Manipulation and Cue

The research design is shown in Table 1. The participants were randomly assigned to four treatment groups. The participants were presented with a vignette describing a patient who needed to seek for treatment. I manipulated the information on both the sector and privacy risk. The vignette varied in terms of whether the organization was described as physical hospital or Internet hospital and high/low privacy risk. Except for the above stimuli, everything else was the same.

In group 1, the vignette was that there was a physical hospital in Mr. Wang's city, and he learned that the hospital was less protective of patients' privacy. In group 2, the vignette was that there was an Internet hospital in Mr. Wang's city, and he learned that the hospital was less protective of patients' privacy. In group 3, the vignette was that there was a physical hospital in Mr. Wang's city, and he learned that the hospital paid great attention to protecting patients' privacy. In group 4, the vignette was that there was an Internet hospital in Mr. Wang's city, and he learned that the hospital paid great attention to protecting patients' privacy.

Table 1. 2×2 Survey Experiment Design

	high privacy risk	low privacy risk
physical hospital	G1, n=80	G3, n=85
Internet hospital	G2, n=57	G4, n=72

3.3. Dependent Variables and Control Variables

The dependent variable was that when Mr. Wang suspected he had depression or physical disease, citizen's intention of the possibility that Mr. Wang would choose for the hospital

(Suppose participant was Mr. Wang), using the Likert scale from 1 to 7. Participants' personal information were collected as control variables (gender, age, degree, salary).

3.4. Hypotheses

H1a: Participant is more likely to go to physical hospital than to Internet hospital when he suspects he has depression.

H1b: Participant is more likely to go to physical hospital than to Internet hospital when he suspects he has physical disease.

H2a: Participant is more likely to go to the hospital with low privacy risk than for hospital with high privacy risk when he suspects he has depression.

H2b: Participant is more likely to go to the hospital with low privacy risk than for hospital with high privacy risk when he suspects he has physical disease.

H3a: For every 1 unit increases in privacy risk, the increase in the possibility of going to Internet hospital is fewer than that to the physical hospital in the context of depression.

H3b: For every 1 unit increases in privacy risk, the increase in the possibility of going to Internet hospital is fewer than that to the physical hospital in the context of physical disease.

H3c: For every 1 unit increases in sector, the increase in the possibility of going to hospital with high privacy risk is fewer than that with low privacy risk in the context of depression.

H3d: For every 1 unit increases in sector, the increase in the possibility of going to hospital with high privacy risk is fewer than that with low privacy risk in the context of physical disease.

4. Results

4.1. Descriptive Statistics

4.1.1. Basic Personal Information

Table 2. Basic personal information

Question	Item	Frequency
Gender	Male	123
	Female	171
Age	20 or below	91
	21-25	121
	26-30	45
	31-35	21
	36-40	12
	41 or above	4
Degree	Middle school or below	6
	High school/ technical and vocational education	50
	Associate degree	81
	Bachelor's degree	143
	Master's degree or above	14
Salary	No salary	93
	3000 yuan or below	53
	3000-5000 yuan	73
	5000-10000 yuan	54
	10000-15000 yuan	14
	15000 yuan or above	7

The personal information is shown in Table 2. There was not much gender difference between the participants. However, in terms of age, the majority of participants were 21-25. This is

because online survey (Tencent questionnaire) is popular with young people. Most participants had bachelor's degree. The salary part may be caused by the age of participants. In addition, balancing checks are shown that the participants were randomly assigned.

4.1.2. Internet Hospitals of the Top 10 Physical Hospitals in China

Table 3. Internet hospitals of the top 10 physical hospitals in China

Rank	Name	Launch time of Internet hospital
1	Peking Union Medical College Hospital	2021.3
2	West China Hospital, Sichuan University	2020.2
3	The General Hospital of the People's Liberation Army	NA
4	Ruijin Hospital, Shanghai Jiao Tong University School of Medicine	NA
5	Zhongshan Hospital affiliated to Fudan University	2020.3
6	The First Affiliated Hospital of Sun Yat-sen University	2020.8
7	Xijing Hospital of Air Force Military Medical University	NA
8	Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology	2020.10
9	Huashan Hospital affiliated to Fudan University	2020.2
10	Peking University First Hospital	NA

This paper retrieved the data in Table 3 through Baidu browser. In Zhejiang Province, where e-government is more developed, Wuzhen Internet Hospital was the first Internet hospital in China. Affected by the epidemic, most physical hospitals have been setting up their own Internet hospitals since February 2020. As shown in Table3, the top 10 physical hospitals in China launched Internet hospitals one after another in these two years. West China Hospital, Sichuan University and Huashan Hospital affiliated to Fudan University opened Internet hospital in February 2020. To avoid cross-infection problems in the early stages of the epidemic, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, located in Wuhan, put its own Internet hospital into use in August 2020. In addition, the Internet hospital of Peking Union Medical College Hospital was put into use in March this year.

4.1.3. Participants' Experiences about Physical and Internet Hospitals

Table 4. Mean of some variables

Item	Mean(low1-high7)
Frequency to physical hospitals	3.371
Frequency to Internet hospitals	2.150
Trust in physical hospitals	4.942
Trust in Internet hospitals	3.088

From Table 4, participants went to physical hospitals more often than Internet hospitals (3.371>2.150). Physical hospitals include public hospitals and private hospitals. Physical public hospitals are public institutions in China and have a strong authority to citizens. Physical private hospitals are also popular with citizens because they can provide attentive medical care. As Internet hospital is a new sector, many citizens do not know much about Internet hospital, so they seldom use Internet hospital to see a doctor. In addition, only some diseases can be diagnosed through Internet hospitals, which cannot meet the needs of various diseases.

In terms of trust, participants trusted physical hospitals more than Internet hospitals (4.942>3.088). This is because the development of physical hospitals has been very perfect.

Perfect institutional conditions, visible doctor information and face-to-face diagnosis enhance citizens' trust in physical hospitals. However, in Internet hospitals, citizens can only communicate with doctors by means of graphic consultation or video consultation, and some diseases of citizens cannot be accurately treated. As a result, many citizens do not have high trust in Internet hospitals.

4.1.4. Dependent Variables

Table 5. Mean of DV

	G1 high privacy risk physical hospital	G2 high privacy risk Internet hospital	G3 low privacy risk physical hospital	G4 low privacy risk Internet hospital
Depression	3.150	2.947	5.388	4.889
Physical disease	3.838	3.000	5.282	4.528

From Table 5, whether faced with depression or physical disease, participants most preferred physical hospitals with low risk of privacy disclosure (G3). In contrast, participants were least likely to go to Internet hospitals where the risk of privacy leakage was high (G2). When the risk of privacy disclosure was high, participants believed that physical diseases were more need to get treatment than depression (3.838>3.150; 3.000>2.947). When the risk of privacy disclosure was low, participants believed that depression were more need to get treatment than physical diseases (5.388>5.282; 4.889>4.528). It can be seen that in the face of the psychological pressure brought by depression, participants would have a sense of shame and were very afraid of the risk of privacy disclosure. Overall, participants rated the level of privacy risk as more important than sector differences. Therefore, participants' choice varied greatly between groups with different levels of privacy.

4.2. Regression

Table 6. Regression model

	(1)Depression No interaction	(2)Depression Interaction	(3)Physical disease No interaction	(3)Physical disease Interaction
Sector (0=Internet hospital; 1=physical hospital)	0.335 (0.206)	0.519. (0.280)	0.905*** (0.229)	0.873** (0.313)
Privacy risk (0=low; 1=high)	-2.166*** (0.201)	-1.941*** (0.306)	-1.551*** (0.224)	-1.589*** (0.342)
Sector*Privacy risk		-0.401 (0.413)		0.069 (0.461)
Control variables(gender, age, degree, salary)	Y	Y	Y	Y
Observations	294	294	294	294
Adjusted R2	0.320	0.319	0.169	0.165

Note: '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 '' 1

4.2.1. Depression/No interaction

From the first column of Table 6, when the variables did not interact, there was no difference in the selection of Internet hospitals and physical hospitals when participants suspected they were suffering from depression. However, participants were significantly less likely to go to the

hospital when the risk of privacy disclosure was higher in the context of depression ($P < 0.001$). This result can support H2a, but can not support H1a. This may be because that more and more citizens begin to pay attention to their privacy, so they tend to protect medical information about depression in China.

4.2.2. Depression/Interaction

From the second column of Table 6, when variables interacted, participants tended to choose physical hospitals when they suspected they were suffering from depression ($P < 0.1$). Participants were significantly less likely to visit the hospital when the risk of privacy disclosure was higher in the context of depression ($P < 0.001$). However, the interaction were not significant, so this result can not support H3a and H3c.

4.2.3. Physical Disease/No Interaction

From the third column of Table 6, when variables did not interact, participants tended to choose physical hospitals when they suspected they were suffering from physical diseases ($P < 0.001$). Participants were significantly less likely to visit the hospital when the risk of privacy disclosure was higher in the context of physical disease ($P < 0.001$). This result can support H1b and H2b. This may be because that physical diseases often require long-term and complex treatment, so citizens believe that physical hospitals provide better services than Internet hospitals. In addition, citizens are very concerned about the privacy of physical diseases.

4.2.4. Physical Disease/Interaction

From the fourth column of Table 6, when variables interacted, participants tended to choose physical hospitals when they suspected they were suffering from physical diseases ($P < 0.01$). Participants were significantly less likely to visit the hospital when the risk of privacy disclosure was higher in the context of physical disease ($P < 0.001$). However, the interaction were not significant, so this result can not support H3b and H3d.

5. Conclusion

The conclusion of this paper is as follows. Based on the literature review, I proposed the research question. That is, the difference of citizens' intention between physical hospitals and Internet hospitals, and whether citizens' intention is affected by privacy risks. Also, I want to know whether different diseases (depression/physical disease) have different results for the selection of hospitals. I conducted the survey experiment and used regression model to test hypotheses. Empirical results can support H1b, H2a and H2b, but can not support H1a and H3. I provided evidence: Participants were significantly less likely to go to the hospital when the risk of privacy disclosure was higher. There was no difference in the selection of Internet hospitals and physical hospitals when participants suspected they were suffering from depression. However, participants tended to choose physical hospitals when they suspected they were suffering from physical disease. Therefore, Internet hospital still has a lot of space to develop. I believe that in the near future, with the development of artificial intelligence, Internet hospitals can provide more services than now.

However, there are still some shortcomings in this paper. On the one hand, the theory part of this paper was weak. On the other hand, the research design in this paper was different from the real situation. For many physical diseases, participants were not exposed to specific tasks through survey experiment. In future studies, theory part needs to be taken seriously. Also, different experiments, especially field experiments, can be conducted to investigate groups that have experienced the medical services in both Internet hospitals and physical hospitals.

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