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The Impact of Reviews of Physicians on Patient Choice

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Abstract: How reviews impact patient choice in health field is still unknown. Patients often worry about their diseases and are eager to find a high skill physician to cure their painful. Traditional hospitals often lack information about individual physician, and with the emergence of online health communities (OHCs), patients can get physician service information on the platform. This study researches the role of reviews in health field and how the roles change with different diseases by collecting data from an online health community. We divide patient reviews into two kinds: online service reviews and offline service reviews based on different services. We find disease risk significantly moderates the relationship between reviews and patient choice: when patients get high-risk diseases, they care more offline service reviews than low-risk diseases. On the contrary, when patients get low-risk diseases, they care more online service reviews than high-risk diseases.

Keywords: Online health communities, Disease risk, Patient choice, Patient reviews

1. INTRODUCTION

The rapid growth of Internet technology provides a platform for consumers to get information on products or services and help them reduce the risk of information asymmetry ^[1], such as Amazon, eBay and Taobao. Consumers can get a lot of information on the platform to reduce their uncertainty and then make their purchase decisions ^[2]. Similarly, in health field, online health communities have become one of the most important sources of health information and the information people searched can decrease their distrust ^{[3][4]}, such as Haodf.com (<http://www.haodf.com/>) and Patientslikeme.com (<https://www.patientslikeme.com/>).

Many studies provide a relevant foundation to address the role of reviews in the consumer choice ^{[5][6]}. Consumer reviews have been thought can help explain variability in performance ^[7]. Previous studies have also shown that consumer decision-making processes are strongly influenced by prior consumers' reviews ^[8-10]. However, in the health field, it is very difficult for patients to get the medical ability and other service quality information about physicians and most of the information patients receive is probably provided by staff in health care ^[11]. As a high-trust service, the role of reviews for healthcare service becomes extremely important.

Online health communities provide a platform for patients to express their experience with physicians. According to Marx^[12], different with e-commerce, health field has several special characteristics: First, information asymmetry is more serious in health field because disease is unique for every patient. Second, the factors related to health should be taken into account, such as the type of diseases and disease risk. Third, consumers search for information in e-commerce mainly for reducing search costs and finding lower product prices ^[13], however, patients often involve strong emotions including fear and anxiety when they searching for physicians' information. Based on the above comments, not all findings relating to e-commerce or online behaviors in general could be generalized to the health care domain. Therefore, it needs to examine the effect of reviews on patient decision-making processes on online health communities.

Although many existing literatures have demonstrated that the reviews of products like beer, CDs, and movies ^[14-16] influence consumer choice, few literatures study the role of reviews on online health communities. We try to investigate how patients make their choices on online health communities based on reviews from other

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patients. We divide service reviews into two kinds: online service reviews and offline service reviews based on their service type. We collect data from an online health community and we take disease risk into account and research how the impacts of reviews change with different diseases. We find first, both online and offline service reviews positively impact patient choice. Second, our findings show that disease risk moderates the effect of online service reviews on patient choice: for high-risk diseases, patients care more offline service reviews than low-risk diseases, and for low-risk diseases, patient care more online service reviews than high-risk diseases.

2. LITERATURE REVIEW

2.1 Online health communities

With the popularity of Web 2.0 technologies, social networking and online communities have become popular for nearly all personal needs. In health field, many online health communities have been developed, for example Haodf.com, which provides a platform for patients to search for illness information and support from other patients and physicians. People increasingly search for help, share information and communicate with physicians on the Internet^{[3][4]} and online health communities, which help patients and their families to consult health information, search for physicians and connect with others, and have become one of the most important sources for health information. According to Pew Internet & American Life Project^[17], 72% adult internet users said they have searched online for health information. There are many advantages of searching for health information online, including cost-reduced, privacy-protected, embarrassment avoided, more efficient and effective^{[18][19]}. Nambisan^[20] indicates that online health communities need to focus more on making information seeking more effective and efficient for their patients and its impact on the physician-patient relationship was likely to be positive^[21]. What's more, online health communities could improve the effect of healthcare by encouraging patients to interact with physicians actively^{[4][22]}.

2.2 Reviews and consumer/patient choice

With the Internet's growing popularity, online consumer reviews are playing an increasingly important role in consumer purchase decisions, and more and more people tend to make choice based on online consumer reviews before buying products or services. Existing studies suggest that the number of online consumer reviews significantly influence consumers' decision-making processes^{[7][9][23-25]}. Consumers are likely to follow the opinion of others and the volume of online consumer reviews are positively associated with the performance^[26]. A large number of reviews may lead consumers to tell themselves: a lot of other people also buy the same products, and help consumers to rationalize their purchase decisions^{[26][27]}. What's more, more consumer reviews may represent more popularity of the product^{[23][24]}. Previous studies have suggested that the more consumer reviews is, the more consumers tend to make purchase decision, which results in increased sales^{[9][28]}.

With the development of online health communities, people are increasingly turning to the Internet for getting health-related information. Researchers have started to investigate the impact of online health-related information and indicate that the information patients find online affects their health care decisions^[29]. Fox et al.^[30] suggest that for 68% people, the medical information that they find on the Internet leads to an effect on their adoption of healthy behaviors. It is also confirmed that online health information is effective to help people to make their health care decisions^{[29][31]}. In addition, interacting with others online may also have an influence on people's decision making^[32].

Online health communities have revolutionized the way patients access health care information^[31] and make decisions. However, how the impact of reviews on online health communities still unknown. Health is important to everyone, and with the development of online health communities, they have more choice in terms of treatment, so it is extremely necessary and important to explore the impact of reviews on patient choice.

3.1 Reviews and patient choice

Existing research has indicated that there is a positive relationship between reviews and sales^{[14][23][41]}. More consumer reviews a certain product has, consumers will be more concerned about this product and make more purchases^{[16][24]}. For instance, Cui et al.^[25] indicate that compared to search products, the number of reviews has a greater impact on sales of experience products as their quality is often unknown before consumption. Duan et al.^[9] find that the number of online postings has a significant effect on box office sales.

Physicians can provide online service (online telephone appointment service) and offline service (face-to-face appointment service), while patients who receive those services can also write corresponding online service reviews and offline service reviews to the physicians. We focus on online telephone appointment service because patients need to pay for it on this platform, so they may be more careful when they make their choices^[42]. Moreover, for offline service, this platform only provides face-to-face appointment function, namely patients do not need to pay for money online and they may need to spend money in the hospitals according to their situations. We examine the impact of online service reviews and offline service reviews on the number of physicians' telephone appointment. For telephone service appointment, online service reviews are direct information about it. However, offline service reviews are feedback of patients for offline face-to-face appointment service specially, so offline service reviews are indirect information for telephone service. Because patients can get both two kinds of reviews from one physician, so although offline service reviews are not feedback for telephone appointment service, they are information for the same physician. Patients can get information from both kinds of reviews, and they can help people get to know more about physicians. So we expect the service reviews (both online and offline) will affect patient choice. Therefore, we hypothesize:

Hypothesis 1(a): Physician's online service reviews positively impact physician's telephone appointment service.

Hypothesis 1(b): Physician's offline service reviews positively impact physician's telephone appointment service.

Online service reviews are direct feedback information for telephone service, but offline service reviews are indirect feedback information for this service, so we believe that patients will focus online service reviews more than offline service reviews when they make choices on online telephone service:

Hypothesis 1(c): Online service reviews have more impact on telephone appointment service than offline service reviews.

3.2 The moderation effects of disease risk

In the field of e-commerce, it has confirmed that consumer characteristics have influences on their choice. Studies have examined male and female consumers exhibited different shopping patterns^[34] and other individual characteristics such as information processing confidence^[33], cognitive personalization^[36] and internet experience^[23] are shown to determine how consumer reviews are perceived and then influence consumer behavior.

Similar to e-commerce, in the healthcare industry, patients' behavior will be affected by their characteristics. We hold the view that for patients with different diseases, the impact of reviews are also different, as different diseases have different information needs. For example, cancer has a high incidence rate and mortality rate (for the year 2014, 151.4 deaths per 100,000 people) in China. When a patient gets cancer, the patient and family members could generate anxious, fear and distress. To cope with this life-threatening disease, the patients with cancer will use the internet for a wide range of information and support needs and pay more attention to seek cancer related information^{[3][43]}. However, cold diseases are easily to deal with, so patients may not be very concerned about it. As a result, patients' behavior is bound to have a big difference for their diseases with different levels of risk. In order to further clarify the impact of reviews on patient choice, we divide

diseases into two types according to risk of the diseases: high-risk diseases and low-risk diseases.

Based on the above comments, there are differences in the effect of reviews on patient choice across high-risk diseases and low-risk diseases. Online service reviews are direct feedback for online telephone appointment service. When patients get high-risk diseases, they may wish to get more direct information. On the contrary, offline service reviews are indirect feedback for online telephone appointment service. Indeed, when patients get high-risk diseases, they could be less willing to get such indirect information. Although offline service reviews also contain medical information of physicians, however, patient need speculate and extend offline service reviews to online service quality. When patients get high-risk diseases, the speculation and extension would have higher level of uncertainty, so patients will consider offline service reviews less related. Based on the above comments, we believe that online service reviews has a greater positive effect on the patient choice for high-risk disease than for low-risk disease, and offline service reviews has a weaker positive effect on the patient choice for high-risk disease than for low-risk disease. Therefore, we hypothesize:

Hypothesis 2(a): Disease risk positively moderates the relationship between physician's online service reviews and physician's telephone appointment amount.

Hypothesis 2(b): Disease risk negatively moderates the relationship between physician's offline service reviews and physician's telephone appointment amount.

4. METHODOLOGY

4.1 Research context

This study researches an online health community-Haodf.com (<http://www.haodf.com/>), which was founded in 2006, and has become the most influential medical information and physician-patient interaction platform in China. It has 343,900 physicians who come from 3,310 regular hospitals. Haodf.com provides its users with several healthcare services, including online consultation service, online telephone appointment service (namely online telephone appointment service) and offline appointment service. While online consultation service allow patients to ask physicians questions online, online telephone consultation service give patients chance to communicate with physicians over telephone and patients can make an appointment with certain physician by offline appointment service. Both online consultation service and offline appointment service are free on the website, but online telephone consultation service has a fees.

Haodf.com creates homepages for each physician. On physicians' homepages, patients can get individual information of physicians, including their hospital information, their disease departments, physicians' medical titles, telephone consultation fee, etc. Moreover, Haodf.com provides a platform for patients to express their experience after receiving services. Importantly, Haodf.com provides two different kinds review forums for patients who receive different services: online service reviews (namely "service evaluation", which is provided for patients who have received online telephone consultation service) and offline service reviews (namely "treatment experience", which is provided for patients who have received offline appointment service). This helps us to study the role of different reviews on patient choice in the health field.

4.2 Sample and data collection

We collected physicians' information and patients' information data from the Haodf.com, and this process was repeated once after one month in order to get the variation for the dependent variable. Like other OHCs website, Haodf.com divides all physicians based on their departments and diseases. According to China Health Statistics Yearbook in 2013^[44], we choose several diseases to represent high-risk diseases and low-risk diseases from two departments based on their mortality rates. China Health Statistics Yearbook lists the mortality rate of various diseases, and we choose the most fatal category of diseases in the list—cancer diseases (mortality rate: 166.33) to represent our high-risk diseases. We choose another category of diseases randomly to represent our

relative low-risk diseases, and our final choice is the gynecological diseases (mortality rate: 0.09). The difference between the mortality rates of the two types of diseases is significant enough for us to distinguish between them and use them to represent high-risk diseases and low-risk diseases, respectively. Overall, we had collected a representative sample on information of 907 physicians treating these two types of diseases.

4.3 Variables and empirical models

In past research on online consumers reviews, sales volume is often used as a measure of consumer choice [23][24], so in this study, we use the number of telephone consultation ($\Delta \text{Ln Telephone Consultation Amount}$) for each physician as our main dependent variable, which measures patient choice. The primary reason is that telephone consultation is the only service that patients need to pay for it. Patients must pay money to get this service, so they will think more seriously and choose a right physician.

For the independent variables, Haodf.com provides two separate forums for online service and offline service. When a patient has received telephone consultation service, then he/she could write an online service review (service evaluation). When a patient has received offline face-to-face service, then he/she could write an offline service review (treatment experience). We use the number of online service reviews (*Online Service Reviews*) and the number of offline service reviews (*Offline Service Reviews*) as our primary independent variables.

For disease risk, In order to distinguish risks of different diseases, we choose diseases with significantly different mortality rates in our sample. According to China Health Statistics Yearbook in 2013 [44], which lists the mortality rate of various diseases, we choose the most fatal category of diseases (cancer diseases) to represent high-risk diseases, and choose another kind of disease randomly to represent low-risk diseases (gynecological disease). For cancer diseases, we finally choose Lung cancer, Breast cancer, Lymphoma, Gastric cancer, Liver cancer, Brain tumor and Osteoma to represent cancer diseases. For gynecological diseases, we finally choose Menstrual disorders, Endocrine disorders, Cervicitis, Vaginitis, Dysmenorrhea, Pelvic inflammatory and Ovarian cyst to represent gynecological diseases. We use a dummy variable to present disease risk (*Disease*). When the disease belongs to the high-risk group, *Disease* equals 1, otherwise equals to 0.

We also introduce other information of the physicians as control variables of the model. Physicians have their own hospitals, but most of the data we have collected are tertiary hospitals, so we no longer use the level of hospitals as the control variable. What's more, physicians have their own titles in the hospital, including chief physician, associate chief physician, attending physician, and no title. We use three dummy variables to measure the physician title (*Title1*, *Title2*, and *Title3*). Telephone fee (*Fee*) will also influence patient choice, so it is also included in our model. Moreover, physicians could choose whether or not they provide three types of service (online consultation, online telephone consultation and offline face-to-face appointment) on Haodf.com, so online consultation service (*Online_Consultation*) and offline face-to-face appointment services (*Offline_Appointment*) will also influence patient choice, so they are also included into our model to control our model. The description of control variables is shown as follows:

$$\textit>Title1} \begin{cases} =1, & \text{when physicain title is } \textit{chief physician} \\ =0, & \text{others} \end{cases}$$

$$\textit>Title2} \begin{cases} =1, & \text{when physicain title is } \textit{associate chief physician} \\ =0, & \text{others} \end{cases}$$

$$\textit>Title3} \begin{cases} =1, & \text{when physicain title is } \textit{attending physician} \\ =0, & \text{others} \end{cases}$$

$$\textit{Online_Consultation} \begin{cases} =1, & \text{when physicain provide online consultation function} \\ =0, & \text{others} \end{cases}$$

$$\textit{Offline_Appointment} \begin{cases} =1, & \text{when physicain provide offline face-to-face appointment function} \\ =0, & \text{others} \end{cases}$$

As we collect these data from two time points separately, for the dependent variable in the model, we use changes between the two time points. All other variables in the model are measured by the data that are collected at the earlier time point. Our empirical model is shown as follows:

$$\begin{aligned}
 &\Delta \text{Ln Telephone Consultation Amount}_t \\
 &= \text{Ln Telephone Consultation Amount}_t - \text{Ln Telephone Consultation Amount}_{t-1} \\
 &= \beta_{11} \text{Title1}_{t-1} + \beta_{12} \text{Title2}_{t-1} + \beta_{13} \text{Title3}_{t-1} + \beta_{14} \text{Fee}_{t-1} + \beta_{15} \text{Online_consultation}_{t-1} \\
 &+ \beta_{15} \text{Offline_Appointment}_{t-1} + \beta_{16} \text{Online Service Reviews}_{t-1} + \beta_{17} \text{Offline Service Reviews}_{t-1} \\
 &+ \beta_{18} \text{Disease} + \beta_{19} \text{Online Service Reviews}_{t-1} \times \text{Disease} + \beta_{10} \text{Offline Service Reviews}_{t-1} \times \text{Disease} + \varepsilon
 \end{aligned}
 \tag{1}$$

5. ANALYSIS AND RESULTS

Table 1 show the descriptive statistics and correlations for key variables used in the empirical model. From Table 1, we can get both online and offline service reviews have significant and positive correlations with physician telephone appointment.

We use OLS model to test out hypotheses, and the results are shown in Table 2. The adjusted R-square value and the significance of F-value suggest that our independent variables explain our dependent variable well. The variance inflation factor (VIF) values of all variables are below 1, which indicates the absence of multicollinearity.

Table 1. Description and correlation

	Mean	Std.	1	2	3	4	5	6	7	8	9
<i>ΔLn Telephone Consultation Amount</i>	0.577	0.826									
<i>Title1</i>	0.44	0.497	0.198**								
<i>Title2</i>	0.40	0.489	-0.096**	-0.717**							
<i>Title3</i>	0.53	0.499	0.176**	0.314**	-0.141**						
<i>Fee</i>	141.92	58.576	0.460**	0.300**	-0.095**	0.145**					
<i>Online_Consultation</i>	0.92	0.274	-0.116**	-0.020	0.002	0.036	-0.223**				
<i>Offline_Appointment</i>	0.24	0.430	0.337**	0.154**	-0.029	0.120**	0.288**	-0.009			
<i>Disease</i>	0.40	0.490	-0.071*	-0.035	0.037	-0.028	0.062	0.070*	-0.005		
<i>Online Service Reviews</i>	2.175	1.299	0.768**	0.255**	-0.123**	0.193**	0.448**	-0.074*	0.416**	-0.102**	
<i>Offline Service Reviews</i>	1.296	1.430	0.595**	0.371**	-0.127**	0.210**	0.450**	-0.082*	0.380**	-0.166**	0.678**

Note: ***p<0.001, **p<0.01, *p<0.05.

Table 2. Empirical model results

Variables	Model1	Model2	Model3
<i>Title1</i>	-0.022 (0.076)	0.170* (0.057)	-0.164* (0.057)
<i>Title2</i>	-0.085 (0.071)	-0.100 (0.052)	-0.096 (0.052)
<i>Title3</i>	0.156** (0.050)	0.057 (0.037)	0.062 (0.037)
<i>Fee</i>	0.005*** (0.000)	0.002*** (0.000)	0.002*** (0.000)
<i>Online_Consultation</i>	-0.101	-0.104	-0.104

Variables	Model1	Model2	Model3
	(0.089)	(0.065)	(0.065)
<i>Offline_Appointment</i>	0.418***	-0.008	-0.013
	(0.058)	(0.045)	0.045
<i>Disease</i>		0.011	-0.071
		(0.036)	(0.069)
<i>Online Service Reviews</i>		0.366***	0.391***
		(0.017)	(0.021)
<i>Offline Service Reviews</i>		0.082***	0.051*
		(0.020)	(0.024)
<i>Online Service Reviews* Disease</i>			-0.067*
			(0.034)
<i>Offline Service Reviews* Disease</i>			0.079*
			(0.037)
Adjusted-R ²	0.263	0.614	0.615
F change	86.558***	272.328***	2.523

Note: ***p<0.001, **p<0.01, *p<0.05, +p<0.10.

Hypotheses 1(a) and 1(b) test the impact of reviews on patient choice. From model 2 in Table 2, we found there is significant and positive impact of online service reviews on patient choice ($\beta=0.366$, $p<0.000$). We also found there is significant and positive impact of offline service reviews on patient choice ($\beta=0.082$, $p<0.05$). These results indicate that patients like to make appointments with physicians with higher reviews amount, and our hypotheses 1(a) and 1(b) are both supported. Hypotheses 1(c) compare the impact of online service reviews and offline service reviews on the number of physicians' telephone appointment. From model 2 in Table 2, in order to compare the impact of the two kinds of service reviews, we use lincom function in STATA to test the impact of online service reviews and offline service reviews. We find that the impact of online service reviews is bigger than the impact of offline service reviews (See the following formula). Hypothesis 1(c) is supported

$$\text{sig } \beta_{\text{online service reviews}} - \beta_{\text{offline service reviews}} = 0.000$$

Hypotheses 2(a) and 2(b) examine the moderation effects of disease risk on the relationship between reviews and patient choice. From model 3 in Table 2, we found the moderation effects of disease risk are significant, but have directions opposite to our hypotheses. For online service reviews, the interaction term is negative and significant ($\beta=-0.067$, $p<0.05$), and for offline service reviews, the interaction term is positive and significant ($\beta=0.079$, $p<0.05$). We got contrary results under different levels of disease risk.

Based on Haodf.com, there are three major differences between online and offline service reviews. First, online service reviews are written by patients who communicate with physicians online, however, offline service reviews are written by patients who communicate with physicians in the hospitals. Face-to-face service is more accurate, and patients often give more information after receiving offline services, and this kind of reviews may be more useful for patients. Second, when a patient has received online service (telephone consultation), he/she will receive a text message to let he/she give an evaluation for that physician, so this behavior is passive to some extent. However, when a patient has received offline service (face-to-face), if he/she wants share treatment experience, he/she has to enter into the website and then write experience, so this behavior is more active. Active information is more truthful than passive information [45]. Third, online service reviews are written by telephone, and the length of them is usually shorter. Offline service reviews are written by computers and

relatively longer, and contain a large amount of information, such as treatment process.

As offline service review has longer length and more comprehensive information, that may explain that why it is more influential in the consumer decision process than a shorter review^{[46][47]}. In our research setting, longer reviews often include more consultation or treatment details, and more about how the physician works under specific contexts. The longer comments can give patient more information and reduce their uncertainty, and help the patients to judge whether the telephone consultation will be helpful for them. It is shown that people who report worse health status have stronger health information needs^[39]. So for high-risk diseases, this would imply that offline service reviews is more influential on patient choice, and that offline service reviews would be likely to be more helpful in making a choice decision. For example, a patient who suffers from high-risk diseases (e.g. cancer) may spend a lot of time and effort on his/her disease. In order to obtain a more accurate and reliable information, they will carefully read the content of the reviews. So we believe that offline service reviews would have a greater positive effect on the patient choice for high-risk disease than for low-risk disease under our setting.

For online service reviews, similarly, the relationship between online service reviews and patient choice may depend on the disease risk, and there is also an interaction effect between disease risk and online service reviews. Unlike offline service reviews which have longer length, online service reviews are relatively shorter. As we mentioned earlier, for high-risk disease, patients may pay more attention on offline service reviews as it contains more valuable information, so to some extent, they do not care about online service reviews that much. But for low-risk disease, patients may pay relatively less attention to the disease, and do not need to spend a lot of time. Those patients tend to be more confident about their subjective situation, and do not need many comments from others. Therefore, they are more open to online service reviews, as it could represent a brief assessment and can be read and comprehended easily.

6. DISCUSSION AND IMPLICATION

Our findings provide us with valuable insights into the role of reviews. Hypotheses 1(a), 1(b) and 1(c) test the impact of review on patient choice. Hypotheses 2(a) and 2(b) investigate the moderation effects of patient characteristics (disease risk) on the relationship between reviews and patient choice. From our empirical results, most of the hypotheses are supported, while we get some interesting findings for the unsupported hypotheses.

Overall, our statistical evidences suggest that physicians with more reviews are more likely to attract patients in the future. Moreover, we prove that disease risk moderates the relationship between reviews and patient choice under our research context. Specifically, when patients get high-risk diseases, they care more about offline service reviews than under low-risk diseases, and when patients get low-risk diseases, patients care more about online service reviews than under high-risk diseases.

Our results suggest that in the health field, like consumers in other fields, patients are very concerned about the reviews from other patients. Prior reviews are important factors that influence the patient choice in the future. Our results suggest that more reviews lead to a positive purchase intention of the patients.

Moreover, our empirical results show that patient choice is influenced by their situation, which is measured by disease risk. Patients with different diseases value different types of reviews differently. For patients who get high-risk diseases, they bear heavy physical pressure, so they are eager to be cured, and give more treatment. These patients hope to get more information on physicians' medical skill, and they are influenced by offline service reviews more than under low-risk diseases. On the contrary, online service reviews have a stronger influence on patients with low-risk diseases than with high-risk diseases.

This study makes three contributions to knowledge. First, although existing literatures have demonstrated that the reviews influence consumer choice and purchase decisions in e-commerce^{[41][48]}, few literatures have

studied the impact of reviews on patient choice on online health communities. Our study fills the research blank by studying an online health community, and we find reviews in health field still positively impact patients' behavior. Second, our study contributes to existing theory of reviews and patient choice by testing the moderating effect of disease risk on the relationship between reviews and patient choice. Specially, our study takes special characteristics of the health field into account. Patient characteristics are quite different from consumer characteristics in e-commerce. Third, we contribute to the studies of reviews by researching two different kinds of reviews based on their characteristics. Although some studies indicated the importance of reviews and confirmed that consumers' decision-making processes are strongly influenced, and have a significant impact on performance^{[6][25][41]}, few studies consider internal difference for different kinds of reviews. Our study indicates that for different kinds of services, the impacts of their corresponding reviews on patient choice are different.

This study also has significant practice implications. For physicians, our findings suggest that patient choice is influenced by prior reviews of other patients. Physicians could try to attract more patients to write feedbacks for them. Moreover, physicians also need to achieve a balance between online service reviews and offline service reviews based on disease type of the physicians they treat. If physicians treat with high-risk diseases, they should pay more attention to offline service reviews, which include more information. On the contrary, if physicians treat with low-risk diseases, they could pay more attention to online service reviews.

This paper has several future directions. First we use cross-sectional analysis, and our future research can adopt longitudinal data to research their dynamic relationship. Second, we only use the number of online/offline service reviews to research the impact of reviews on patient choice, our future research will dig text information deeply and analysis text features, especially for the three different characteristics of online service reviews and offline service reviews.

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REFERENCES

- [1] Dellarocas, C. (2003). The digitization of word of mouth: Promise and challenges of online feedback mechanisms. *Management Science*, 49 (10):1407-1424.
- [2] Ye, Q., Law, R., Gu, B. (2009). The impact of online user reviews on hotel room sales. *International Journal of Hospitality Management*, 28 (1):180-182.
- [3] Ziebland, S., Chapple, A., Dumelow, C., Evans, J., Prinjha, S., Rozmovits, L. (2004). How the internet affects patients' experience of cancer: a qualitative study. *Bmj*, 328 (7439):564.
- [4] Xiao, N., Sharman, R., Rao, H. R., Upadhyaya, S. (2014). Factors influencing online health information search: An empirical analysis of a national cancer-related survey. *Decision Support Systems*, 57417-427.
- [5] Chen, P.-Y., Dhanasobhon, S., Smith, M. D. (2008). All reviews are not created equal: The disaggregate impact of reviews and reviewers at amazon. com. *Com* (May 2008).
- [6] Chevalier, J. A., Mayzlin, D. (2006). The effect of word of mouth on sales: Online book reviews. *Journal of marketing research*, 43 (3):345-354.
- [7] Xie, K. L., Zhang, Z., Zhang, Z. (2014). The business value of online consumer reviews and management response to hotel performance. *International Journal of Hospitality Management*, 431-12.
- [8] Goldenberg, J., Libai, B., Muller, E. (2001). Talk of the network: A complex systems look at the underlying process of word-of-mouth. *Marketing letters*, 12 (3):211-223.

- [9] Duan, W., Gu, B., Whinston, A. B. (2008). Do online reviews matter?—An empirical investigation of panel data. *Decision Support Systems*, 45 (4):1007-1016.
- [10] Ye, Q., Law, R., Gu, B., Chen, W. (2011). The influence of user-generated content on traveler behavior: An empirical investigation on the effects of e-word-of-mouth to hotel online bookings. *Computers in Human Behavior*, 27 (2):634-639.
- [11] Carlsson, M. E. (2000). Cancer patients seeking information from sources outside the health care system. *Supportive care in cancer*, 8 (6):453-457.
- [12] Marx, G. T. (2006). *Soft Surveillance: The Growth of Mandatory Volunteerism in Collecting Personal Information* “Hey Buddy Can You Spare a DNA?”.
- [13] Jennifer Zhang, J., Fang, X., Liu Sheng, O. R. (2006). Online consumer search depth: Theories and new findings. *Journal of Management Information Systems*, 23 (3):71-95.
- [14] Clemons, E. K., Gao, G. G., Hitt, L. M. (2006). When online reviews meet hyperdifferentiation: A study of the craft beer industry. *Journal of Management Information Systems*, 23 (2):149-171.
- [15] Ghose, A., Ipeiritos, P. (2006). Towards an understanding of the impact of customer sentiment on product sales and review quality. *Information Technology and Systems*, (12):1-6.
- [16] Dellarocas, C., Zhang, X. M., Awad, N. F. (2007). Exploring the value of online product reviews in forecasting sales: The case of motion pictures. *Journal of Interactive marketing*, 21 (4):23-45.
- [17] Project, P. I. A. L. (2014). <http://www.pewresearch.org>.
- [18] Cline, R. J., Haynes, K. M. (2001). Consumer health information seeking on the Internet: the state of the art. *Health Education Research*, 16 (6):671-692.
- [19] Ybarra, M., Suman, M. (2008). Reasons, assessments and actions taken: sex and age differences in uses of Internet health information. *Health Education Research*, 23 (3):512-521.
- [20] Nambisan, P. (2011). Information seeking and social support in online health communities: impact on patients' perceived empathy. *Journal of the American Medical Informatics Association*, 18 (3):298-304.
- [21] Murray, E., Lo, B., Pollack, L., Donelan, K., Catania, J., White, M., Zapert, K., Turner, R. (2003). The impact of health information on the internet on the physician-patient relationship: patient perceptions. *Archives of internal medicine*, 163 (14):1727-1734.
- [22] Cline, R. J. W., Penner, L. A., Harper, F. W., Foster, T. S., Ruckdeschel, J. C., Albrecht, T. L. (2007). The roles of patients' internet use for cancer information and socioeconomic status in oncologist-patient communication. *Journal of Oncology Practice*, 3 (3):167.
- [23] Zhu, F., Zhang, X. (2010). Impact of online consumer reviews on sales: The moderating role of product and consumer characteristics. *Journal of Marketing*, 74 (2):133-148.
- [24] Zhang, Z., Zhang, Z., Wang, F., Law, R., Li, D. (2013). Factors influencing the effectiveness of online group buying in the restaurant industry. *International Journal of Hospitality Management*, 35:237-245.
- [25] Cui, G., Lui, H.-K., Guo, X. (2012). The effect of online consumer reviews on new product sales. *International Journal of Electronic Commerce*, 17 (1):39-58.
- [26] Zhang, Z., Ye, Q., Law, R., Li, Y. (2010). The impact of e-word-of-mouth on the online popularity of restaurants: A comparison of consumer reviews and editor reviews. *International Journal of Hospitality Management*, 29 (4):694-700.
- [27] Park, D.-H., Lee, J., Han, I. (2007). The effect of on-line consumer reviews on consumer purchasing intention: The moderating role of involvement. *International Journal of Electronic Commerce*, 11 (4):125-148.
- [28] Liu, Y. (2006). Word of mouth for movies: Its dynamics and impact on box office revenue. *Journal of Marketing*, 70 (3):74-89.
- [29] Wang, J., Xiao, N., Rao, H. R. (2012). An exploration of risk information search via a search engine: Queries and clicks in healthcare and information security. *Decision Support Systems*, 52 (2):395-405.

- [30] Fox, S., Raine, L. (2011). How internet users decide what information to trust when they or their loved ones are sick. Pew Internet & American Life Project. 2002.
- [31] Lambert, S. D., Loisel, C. G. (2007). Health information—seeking behavior. *Qualitative health research*, 17 (8):1006-1019.
- [32] Lorig, K. R., Laurent, D. D., Deyo, R. A., Marnell, M. E., Minor, M. A., Ritter, P. L. (2002). Can a Back Pain E-mail Discussion Group improve health status and lower health care costs?: A randomized study. *Archives of internal medicine*, 162 (7):792-796.
- [33] Lee, H.-H., Jin Ma, Y. (2012). Consumer perceptions of online consumer product and service reviews: Focusing on information processing confidence and susceptibility to peer influence. *Journal of Research in Interactive Marketing*, 6 (2):110-132.
- [34] Shabbir, M. J., Safwan, N. (2014). Consumer Shopping Characteristics Approach and Gender Difference in Pakistan. *Journal of Marketing Management*, 2 (2):01-28.
- [35] Bae, S., Lee, T. (2011). Gender differences in consumers' perception of online consumer reviews. *Electronic Commerce Research*, 11 (2):201-214.
- [36] Xia, L., Bechwati, N. N. (2008). Word of mouse: the role of cognitive personalization in online consumer reviews. *Journal of interactive Advertising*, 9 (1):3-13.
- [37] Powell, J., Clarke, A. (2006). Internet information-seeking in mental health Population survey. *The British Journal of Psychiatry*, 189 (3):273-277.
- [38] Manfredi, C., Czaja, R., Price, J., Buis, M., Janiszewski, R. (1992). Cancer patients' search for information. *Journal of the National Cancer Institute. Monographs*, (14):93-104.
- [39] Baker, L., Wagner, T. H., Singer, S., Bundorf, M. K. (2003). Use of the Internet and e-mail for health care information: results from a national survey. *Jama*, 289 (18):2400-2406.
- [40] Bornstein, B. H., Marcus, D., Cassidy, W. (2000). Choosing a doctor: an exploratory study of factors influencing patients' choice of a primary care doctor. *Journal of evaluation in clinical practice*, 6 (3):255-262.
- [41] Chintagunta, P. K., Gopinath, S., Venkataraman, S. (2010). The effects of online user reviews on movie box office performance: Accounting for sequential rollout and aggregation across local markets. *Marketing Science*, 29 (5):944-957.
- [42] Tatzel, M. (2002). "Money worlds" and well-being: An integration of money dispositions, materialism and price-related behavior. *Journal of Economic Psychology*, 23 (1):103-126.
- [43] Lee, S. Y., Hwang, H., Hawkins, R., Pingree, S. (2008). Interplay of negative emotion and health self-efficacy on the use of health information and its outcomes. *Communication Research*.
- [44] Yearbook, C. H. S. (2013). <http://www.nhfpc.gov.cn/htmlfiles/zwgkzt/ptjnj/year2013/index2013.html>.
- [45] McKnight, D. H., Choudhury, V. (2006). Distrust and trust in B2C e-commerce: Do they differ? In *Proceedings of the 8th international conference on Electronic commerce: The new e-commerce: innovations for conquering current barriers, obstacles and limitations to conducting successful business on the internet*, pp. 482-491: ACM.
- [46] Mudambi, S. M., Schuff, D. (2010). What makes a helpful review? A study of customer reviews on Amazon. com. *MIS quarterly*, 34 (1):185-200.
- [47] Kuan, K. K., Hui, K.-L., Prasarnphanich, P., Lai, H.-Y. (2015). What Makes a Review Voted? An Empirical Investigation of Review Voting in Online Review Systems. *Journal of the Association for Information Systems*, 16 (1):48-71.
- [48] Sun, M. (2012). How does the variance of product ratings matter? *Management Science*, 58 (4):696-707.