The Impact of Physicians' Health Science Short Video Releasing Behaviour on Online Consultation Volume

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Abstract: Although physician engagement in social media or online healthcare communities is attracting increasing attention from scholars recently, few studies bridge the physician health science content sharing behaviour on short video platforms and their service behaviour on online healthcare platforms. This study investigates the impact of physicians' health science short video sharing on their personal online consultation volume drawing on the channel effect and trust theory. By collecting empirical evidence from a large online healthcare website (haodf) and conducting difference-in-differences (DID) analysis, we found that releasing health science short videos can improve physicians' online consultation volume. Specifically, for physicians with higher prior online consultation volume, the impact of health science video sharing behaviour on their online consultation volume is greater than physicians with lower prior online consultation volume. This study contributes novel insights into the channel effect between short video platforms and online healthcare platforms and several practical implications for administrators of short-form video platforms and online consultation platforms, physicians and patients.

Keywords: short video sharing, online healthcare consultation, channel effect

1. INTRODUCTION

The explosive popularity of short-form video platforms has led to an increasing number of users from diverse background to actively share and watch videos on these platforms. Recently, some large platforms, i.e. TikTok, have established the strategy to involve more physicians to join the platform to share and spread health science content. Meanwhile, policies were also launched to improve the quality and quantity of health science and knowledge content on the platform. For example, the Science Communication Bureau of the Chinese Academy of Sciences, TikTok and several scientific research institutions jointly released the "DOU Knowledge Plan" which aims to disseminate scientific knowledge to the public by encouraging physicians to actively contribute high-quality content and create a new landscape for knowledge dissemination. Since the outbreak of COVID-19 epidemic, a growing number of physicians from related clinical department have started to engage in the short-form video platform. These physicians continously create and share health science knowledge to a broad audience via their personal short-form video accounts. The followers of influencing physicians has exceeded 10 million.

In this study, we define these physicians as "physician influencer". Posting video content gives physicians an additional voice channel for publicizing themselves and establishing their professional authority. Physicians' engagement in social media or online communities has been found to showcase trust[1], enhance physician image and reputation[2][3], establish good relationships with patients[3-5], and even boost online economic returns[4][6]. Prior research suggest that the general knowledge sharing by broadcasting articles can be an efficient approach for physicians to recruit patients[6]. Short videos contains richer information than textual content such as physicians' image and body movement, objects used for illustration, physicians' environmental settings, etc. Therefore, the way that health science videos influence viewers may be more complex and may

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differ from prior findings. However, to our best knowledge, prior research have not investigate if the publication of health science videos by physician influencers has the potential to convert users on social media platforms to online consultation platforms to purchase online consultation services. Therefore, we postulate that these physician influencers achieve higher follower trust than ordinary physicians, and their followers have a higher chance to consult them for healthcare service.

The conceptual model of this study is illustrated in Figure 1. To investigate the above question, we collect data of 607 physicians over 19 quarters from a large well-known short video platform TikTok and a leading Chinese online healthcare service platform Haodf (https://www.haodf.com/), and perform a difference-in-differences (DID) analysis.
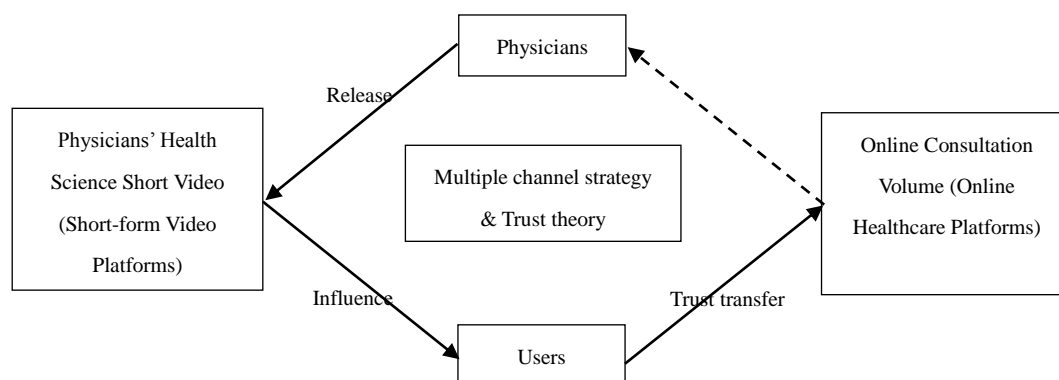
Figure 1.   The relationship between the publication of health science videos and purchase online consultation services

The main contributions of this study are as follows. First, we unlock the intricate channel effects between social media platforms and online healthcare service platforms. Second, our research provides insights in the phenomenon of physician influencers and the potential impact of broadcasting health science videos. Third, our findings provide managerial implication that platform administrators can motivate physicians' engagement in sharing health science videos on social media, thus to enhance platforms' performance.

2.   LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

We employ multiple channel strategy and trust theory to understand whether and how the sharing of health science videos influences physician's online consultation volume. The central idea of the multiple channel strategy is that platforms interact with users through multiple channels can provide different types of services economically and efficiently[1]. A review of the online health communities literature shows that using multiple channels tend to be more successful as patients' trust will be enhanced and perceived risk will be reduced in online consultation[7]. Social media platforms serve as another interactive channel for patients to interact with physicians besides the online healthcare platforms. Users can interact with physicians in a more casual way, such as clicking likes, making comments, and reposting content. Users who tend to be rational and calculating incline to be guided by the subjective information provided by social media when selecting online healthcare services[8]. Therefore, social media may reshape the landscape of online healthcare as it can be leveraged by patients to drastically alleviate information asymmetry, thus enables a growing number of patients to access health science knowledge for better decision-making.

The trust theory has been extensively studied and applied in sociology, psychology, economics and management[9]. Recently, the trust theory has been extended to the social media and online healthcare context. It outlines how users build online trust by exchanging opinions and interact with posters in social media. Since

users have been overwhelmed with mixed kinds of health related information, both accurate and inaccurate, it is critical for users to access reliable and trustworthy source of health information on the Internet[10]. Information shared by doctors on social media is perceived to be more reliable than search engines[11]. There are three mechanisms of trust theory that can explain the influence of physicians' characteristics on patient selection, including institution-based trust, knowledge-based trust and trust transfer process[9].

Short video platforms lower the bar for content acquisition[5] and users have interaction opportunity with physicians on the short-form video platforms. Institution-based trust arises when users are willing to use the services provided by the short-form video platforms and maintain trust for the platform. This type of trust is also strengthened when users notice that the physician posters are employees of reliable public hospitals and healthcare institutions. Moreover, doctors are the authoritative guarantee of medical and health content[9]. Physicians have to be officially authenticated by the platform to post health science videos as doctors. In the video content, many physicians choose to wear white robes and show their real face to gain trust from audience. The background of videos are often their office in the hospital and some doctors utilize medical equipment as props for shooting videos. In this way, knowledge-based trust is naturally formed while users watch physicians' health science videos continuously and accept the knowledge transmitted by physicians.

Due to policy restrictions, platform users cannot directly purchase online consultation service of doctors on short-form video platforms. Patients who have health problems and have watched the relevant videos released by known physicians may already formed trust for the physician[5]. Meanwhile, patients can find the consultation platform of the physician by private messaging and online search. Some doctors will take the initiative to provide users with clues about how to consult them in the content of the video. The trust transfer process[3] suggest that when users have trust on the physician's health science video content, users are more likely to trust the online consultation platform where doctors provide consultation services, which may promote their purchasing of physician's online consultation services. Therefore, releasing health science videos by physicians may improve patient trust, which enhances physicians' online consultation volume. The following hypothesis is proposed:

Hypothesis 1: The release of health science short videos by physicians' significantly affects their online healthcare consultation volume.

The number of patients who follow up a physician on the platform after consultation can be seen as a recognition of the physician's competence and proficiency and can measure the trust between the physician and the patient[1]. Because of lacking relevant health knowledge and experience, the users have to rely on second-hand information such as electronic word-of-mouth of physicians to form their initial trust and attitudes, so a patient is likely to trust a physician with good electronic word-of-mouth and believes that the doctor can serve the patient better[4]. In the decision-making stage of whether to select the physician for online consultation, when the patient is still uncertain about the physician's service quality, the patient is likely to evaluate the number of patients consulted by the physician and make a decision[12]. Similarly, for users who learn about physicians through watching their health science videos, the amount of physicians' online healthcare service consultations may also affect their decision-making process. Therefore, following hypothesis is proposed:

Hypothesis 2: Other conditions remain unchanged, the release of health science short videos by physicians' has different impact on physicians with different prior online consultation volumes.

3.   RESEARCH DESIGN

3.1 Methodology

We use the difference-in-differences analysis to examine the relationship between physician's health science video release and online consultation volume, based on the following regression set-up:

$$SerVolume_{it} = \beta + \delta_1 Post_{it} + \delta_2 X_{it} + \mu_i + \gamma_t + \varepsilon_{it} \quad (1)$$

In equation (1), $SerVolume_{it}$ is a measure of the online consultation volume of physician i in a quarter of a year t. μ_i and γ_t are vectors of physician and a quarter of a year as dummy variables that account for physician and time fixed effects, X_{it} is a set of control variables, and ε_{it} is the error term. The variable of interest is $Post_{it}$, a dummy variable that equals one in the quarter of years after physician i releasing health science videos and zero otherwise. The coefficient, δ_1, therefore indicates the impact of health science video release on online consultation. A positive and significant δ_1 suggests that health science video release exerts a positive effect on the online consultation volume, while a negative and significant δ_1 indicates that health science video release pushed online consultation volume lower.

The difference-in-differences estimation technique provides us with a way to control omitted variables[13]. We include time-specific dummy variable to control for trends that shape online consultation volume over time and physician-specific dummy variable to control for unobserved time-invariant physician characteristics that shape online consultation volume across physicians. We estimate equation (1) allowing for physician-level clustering of the errors, that is allowing for correlation in the error terms over time within physicians.

To further investigate the impact of physicians' health science short video release on their online consultation volume when physicians have different prior online consultation volume levels, we construct a quantile regression model as shown in equation (2):

$$Q_q \ (SerVolume_{it}| Post_{it}) = \beta_{q0} + \sum \beta_{qi} Post_{qi} \quad (2)$$

Among them, β_{qi} represents the impact of the release of short videos of physicians' health science popularization on the online consultation volume under the quantile q.

3.2 Data collection and variable measurement

We selected TikTok and Haodf online as the focal platforms considering that many physicians have been officially certified on TikTok with a yellow V-shaped logo implying their professionalism, and these physicians also offer healthcare consultation service on Haodf, which is a leading online healthcare platform in China. To identify these physicians on Tiktok, we obtained the list of individual physicians from a social media data set website named Huitun (https://dy.huitun.com/). Our sample covered physicians who have shared health science videos during the period from January 2017 to September 2021. Using web crawling technique, we obtained physician information such as full name, professional title, video records. Then, we identified these physicians' personal online consultation web page on Haodf. Physician information on Haodf includes full names, physicians' online consultation records, physician's professional title, and physician's department. After that, we crosschecked the physician's name, professional title, and department with the corresponding content on TikTok to varify whether the account indeed belonged to that physician. After removing inactive accounts which never release any health science videos, we obtained valid data for 607 physicians, over the 19 quarters time period, so the 11,533 physician-quarter observations serve as the basis for our analysis.

Table 1.   Variables description

Variable types	Name	Variable	Variable definition
Dependent variable	Online consultation volume	SerVolume	Number of online consultations of a physician in a quarter
Independent variable	The release of health science videos by physicians	Post	In the quarter of investigation or earlier, physicians have released short-form health science videos = 1, if not= 0
Control variable	Physician's professional title	Prof	The samples are divided into four categories according to the professional title certified by the platform on the homepage of Haodf online. Resident physician=1, attending physician=2, associate chief physician=3, chief physician=4
	Physician's department	Depart	The samples are divided into many categories according to the physician's department certified by the platform on the homepage of Haodf online

The statistical characteristics of each variable are shown in Table 1. Online consultation volume acts as the dependent variable, defined as the online consultation volume of physicians in the observation quarter. Short-form health science videos releasing acts as the independent variable. We control physicians' professional titles and physicians' departments that may affect online consultation volume[14]. In China, physicians in hospitals have an offline title reevaluated and issued by government agencies, which are divided into several levels - chief physician, associate chief physician, attending physician, and resident physician, reflecting their medical skills and experience[7]. The physicians' professional titles and departments are certified by the platform on the homepage of Haodf online. Table 2 reports the descriptive statistical results of the main variables.

Table 2.   Statistical summary of focal variables

Variable	Obs	Mean	Std. dev.	Min	Max
SerVolume	11532	57.46505	441.3547	0	28080
Post	11533	0.2566548	0.4368062	0	1
Prof	11533	2.902801	1.153274	1	4
Depart	11533	107.6903	50.83545	1	200

4.   Empirical analysis and results

4.1 Baseline regression analysis

We use Stata 15 to analyze our data set and Table 3 reports the analysis results. According to the results, the coefficient is positive and statistically significant (p < 0.1) when the control variable is added or not. This indicates that the release of health science videos can improve physician online consultation volume. Hypothesis 1 is therefore supported.

In terms of control variables, physician's professional title and physician's department have a significant impact on the amount of physicians' online consultation, and the results are in line with the actual situation that patients have specific requirements for physician's professional title. Compared with physicians with different professional titles, physicians with high professional titles are often more likely to be preferred by patients and be exposed to more incurable diseases, thus have more patient resources and better reputation. Due to the halo effect, more patients will choose to consult with "famous physicians"[6] and these physicians may have more online consultations.

Table 3.   Empirical model results

	FE	FE
Post	21.356327* （1.79）	23.341815* （1.87）
Prof		.141937** （2.25）
Depart		-.02494671* （-1.91）
Constant	34.979406*** （6.61）	31.447925*** （4.35）
Physician FE	YES	YES
Time FE	YES	YES
Number of obs	11532	11532
R-squared	.0993	.1004

Note: T value of the variable are reported in parentheses; Signifincance level: * p<.1; ** p<.05; *** p<.01.

4.2 Quantile regression analysis

In order to further explore the heterogeneity characteristics of physicians' health science short video releasing behaviour at different levels of online consultation volume, we applied quantile regression model for

0.25, 0.50 and 0.75 quantiles (QR_25, QR_50, QR_75). The higher the quantile value indicates the higher online consultation volume of doctors. The results in Table 4 reveal that impact of the release of health science short videos on physician's online consultation volume is higher for physicians (beta coefficient value is 29.375) with a relatively higher level of online consultation volume (0.75 quantile) than for physicians (beta coefficient value is 9.875 and 6.4375) with relatively lower level of online consultation volume (0.25 quantile and 0.50 quantile). Thus the impact of the release of health science videos on physician's online consultation volume increases as the physician's online consultation volume grows. This aligns with the DID regression results, and hypothesis 2 is therefore supported.

Table 4.   Parameter estimates of quantile regression model for different quantiles with online consultation volume

	QR_25	QR_50	QR_75
Post	9.875***	6.4375***	29.375***
Std. err.	.4277922	.1883387	.1206634

Note: Signifincance level: * p<.1; ** p<.05; *** p<.01.

The reason for this situation may be that the total number of physicians, whose consultation volume is at the 25% quantile, may not offer the online consultation service on Haodf online for a considerable time period. This also indicates the existence of a larger room for improvement in their consultation volume. Physicians with a total consultation volume at the 75% quantile may be quite proficient in video creating and sharing, and they are actively engage in social media platforms. They can effectively leverage the channel effect between different platforms and naturally guide the social media followers to consult them on their healthcare service platforms.

5.   CONCLUSIONS

This study examines the effects of the release of health science short video by physician on their on online healthcare consultation volume. Our findings provides compelling evidence that posting health science short videos can help physicians to attract more consultations on online healthcare platforms as they gain higher user trust. We also find that physicians with higher prior consultation volume who engage in TikTok through intensive health science content sharing can more effectively attract healthcare consultations.

This study bridges social networking platform with online healthcare consultation platform to investigate the cross-platform influence of physicians' video sharing behavior. However, this study has the limitation that we only consider two platforms (TikTok and Haodf), our findings needs to be varified with data from different platforms in future study.

Our findings provides important implications for administrators of social media or online consultation platforms. Collaborations between short video platforms and online healthcare service platforms may further strengthen this channel effect and provide audience with both reliable health science knowledge and consultation physicians.

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