A Study on the Intention to Use Korean Telemedicine Services: Focusing on the UTAUT2 Model

Harim Byun and Jongwoo Park

Abstract With the outbreak of the recent COVID-19 pandemic, the importance and demand of telemedicine, a method of supply medical services in a non-face-to-face manner, is spreading worldwide. Despite its high medical standards and IT technology, the telemedicine practice between medical staff and patients is not allowed in Korea. Therefore, this study was intended to examine the factors influencing on the intention to use Korean telemedicine services from the perspective of potential consumers in China and Vietnam as a pavement basic work to expand Korean telemedicine services overseas. To this end, the UTAUT2 model was reconstructed to be suitable for the study on the acceptance of telemedicine service; users’ perceived perception on Korean telemedicine services (i.e. performance expectancy, effort expectancy, social influence, price value, perceived risk) and personal characteristics (i.e. innovativeness and concern for health) were set as main variables; and their relationship with the use intention was empirically analyzed. As a result of the analysis, it was found that, performance expectancy, social influence, price value, and perceived risk factors, except for effort expectancy, have a significant relationship influencing on the use intention. In addition, it was confirmed that innovativeness and concern for health have a moderating effect on the relationship between performance expectancy and use intention. Finally, specific implications derived based on the analysis results are expected to be used as basic data for seeking global strategies for Korean medical services in conjunction with the overseas expansion of the Korean telemedicine service-related businesses.

Keywords COVID-19 · Telemedicine · UTAUT2 · Korean telemedicine service · Telehealth · Global medical service · Perceived risk · Use intention

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1 Introduction

The recent outbreak of COVID-19 pandemic is accelerating a “zero contact society” worldwide. Under the main word of ‘isolation and closure’, we are experiencing changes in all lifestyles and industries (e.g. consumption, distribution, education, etc.). In particular, as the necessity and market demand for the virtual telemedicine in which medical staff and patients do not face each other have been confirmed, the virtual telemedicine is rapid spreading worldwide, especially in the advanced [1].

Global Market Insights reported that the scale of the global digital healthcare market is expected to grow from KRW130 trillion (USD16.4 Billion) in 2019 to KRW600 trillion (USD5.404 Billion) in 2025, by an annual average of 29.6%; and the scale of telemedicine market is also expected to reach $32.71 Billion by 2027 [2].

With its advantages, such as improving access to medical services and reducing medical costs in addition to the prevention of infection on account of its non-contact method, the telemedicine has emerged as a solution to the rapid increase in medical expenses caused by the aging of the population, and the number of corporations and governments in many countries promoting the telemedicine is increasing rapidly. In particular, in countries with high-level medical and IT technologies (e.g. the United States, Europe, and Japan), the telemedicine service is being promoted in response to growing demand for efficient health care, and various business models are being developed.

Korea has demonstrated its remarkable response capabilities based on rapid diagnosis, thorough quarantine and high-level medical standards during this COVID-19, gaining credibility worldwide. As a result, K-bio and K-medicine of Korea in conjunction with Korean Wave have gained international credibility. In addition, Korea, with high-level information and communication technology enough to commercialize 5G for the first time in the world, has the best conditions to provide telemedicine services beyond doubt. However, Korea is the only country in the world that telemedicine practice between medical staff and patients is not allowed to date for the reasons of the issues related to proving the effectiveness and safety of telemedicine for many years [3]. In addition, on account of various legal regulations, the development of related technologies, the scale of related corporation and investments and the growth rate of corporation concerned are very low compared to other countries. Now, the telemedicine service attracts intense attention as “must-have” rather than “good-if-we-have” service before and after the outbreak of the global epidemic. In order not fall behind such an inevitable global change, it is necessary to first develop it as a global medical service business by turning our eyes to overseas markets where telemedicine service can be more freely implemented, not to the domestic market. In particular, telemedicine service can be intensely used as a strategic means to attract overseas patients into Korea and to increase the possibility of the overseas expansion of Korean medical institutions and medical consultations for potential medical tourists are intensely being conducted remotely in preparation for the Post-COVID.
Studies on the acceptance and use of new information technologies are said to be an advanced study field, but studies on the acceptance of technologies in the health care have relatively seldom been conducted [4]. In particular, for the telemedicine, studies have mainly focused on the possibility of technical implementation to date, and studies on the inducement of practical use of technologies have been conducted mostly on the Koreans for whom it is difficult to apply the telemedicine in Korea, so they are considered to have limitations in light of the effectiveness of studies [5]. Therefore, this study has focused on China and Vietnam as main overseas market for telemedicine service at the present time after thoroughly reviewing the rankings of medical tourists visiting Korea by country, the status of the overseas expansion of Korean medical institutions and the constraints on overseas telemedicine services (i.e. accessibility, time difference between countries and the extent of telemedicine activation within the country), conducting an empirical on the potential customers in those countries. In addition, this study intends to discover the acceptance factors related to Korean telemedicine service and confirm the causal relationship with the use intention by using UTAUT (Unified Theory of Acceptance and Use of Technology). The ultimate purpose of this study is to predict the possibility of the success of Korean telemedicine service business in overseas markets; derive matters to supplement; and ultimately provided basic data needed for seeking strategies to globalize Korean medical services, including medical tourism.

2 Theoretical Background

2.1 The Concept and Definition of Telemedicine Service

There is no unified definition of the concept of telemedicine. In general, various terminologies (i.e. Telemedicine, Telehealth, Telehealthcare, e-health and U-health) are currently used interchangeably.

When classifying the concepts of the ‘telemedicine’ and the ‘telehealth’, which are being most commonly used interchangeably, the telemedicine is a concept that includes telehealth, and the telehealth occupies part of the telemedicine. The telemedicine can be understood as the remote replacement of the treatment of patients by doctors in an in-hospital clinic through various communication technologies (e.g. video treatment, telephone treatment, remote secondary medical opinion and remote prescription, etc.). On the other hand, the telemedicine is a comprehensive concept that includes both remote patient monitoring and remote surgery, which are services that remotely monitor patient health and disease in addition to treatment-related services [3].

When looking at a few of conceptual definitions of telemedicine, Krupinski et al. [6] defined the telemedicine as the “exchange of patient-related health information between geographically distant medical service providers or between providers and consumers (patients) through telecommunication technology and computers for the
purpose of evaluation, diagnosis, treatment and education”, and the World Medical Association (WMA) defined telemedicine as “a medical practice that determines and recommends intervention, diagnosis and treatment for diseases based on clinical data, records and other information transmitted from a distance through a telecommunication system”. Also the World Health Organization (WHO) defined the telemedicine as the “act of all medical experts to prevent, diagnose, treat diseases or injuries; continuously educate medical service providers; and provide useful information and medical services for communities and local residents from distant places using information and communications technologies” [7].

When looking at these definitions, the telemedicine is viewed differently, focusing on the central functions performed (e.g. viewing the telemedicine as an alternative means of face-to-face treatment and viewing it as exchange of technology and medical information), but what is common between various definitions is viewing the telemedicine as the combination of medical service and information and communication technology. This study views the telemedicine from a comprehensive perspective and defines the telemedicine as all medical-related activities performed in a non-contact manner using information and communication technology between various telemedicine service providers and telemedicine service recipients.

2.2 The Current Status of Overseas Telemedicine Service Businesses at Home and Abroad

Thailand, Singapore, and India leading the global medical tourism market have introduced the telemedicine from the beginning of 2000 as a countermeasure in response to the gradual decline in the profits from medical tourists [8]. Table 1 briefly shows the

| Country (hospital)       | Contents                                                                                                                                 |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Thailand (Bumrungrad Hospital) | Through “Global Care Solution (GCS)” project (i.e. an online pre-treatment) promoted in collaboration with MS from Dec 2007, it has strengthened its pre-treatment function, shortening waiting time |
| Singapore (Raffles Hospital) | Through the operation of an online communication channel called “ASK RMG” since 2008, medical staff responds in detail to inquiries about health care from overseas customers in real time. This promotes hospitals naturally, resulting in an increase in the number of recruited customers |
| India (Apollo Hospital)   | Founding the “Remote Medical Network”, it has established telemedicine service cooperation system in 9 countries (e.g. Southwest/Central Asia, including Sri Lanka, Pakistan, Nepal, Bangladesh, Myanmar, and Africa) |

Source Taegyu et al. [8]
current status of the telemedicine services at the representative hospitals attracting overseas patients in Thailand, Singapore and India.

In addition, Cuba is providing telemedicine services to countries in Central America and the Caribbean, and Mexico has been conducting international telemedicine services through cooperation with specific medical institutions in the United States by intensively investing in the telemedicine infrastructure since 2014.

In the early 2000s, Korea’s overseas telemedicine service business began as part of Official Development Assistance (ODA) project for countries with underdeveloped health care environment, and as a result, the number of successful cases attracting and treating patients in Korea has gradually increased [9].

As a result of the successful operation of the U-Health system, a remote video treatment system installed in Vladivostok, Russia in 2011, Gangnam Severance implements the personalized medical services for overseas patients, promoting the recruitment of patients.

Seoul National University Hospital has been actively implementing remote reading and remote consultations that receive medical opinions and consultation from Seoul National University Hospital through a computational monitoring system (PPCC: Pre-post Care Center) installed in the Sheikh Khalifa Hospital in the United Arab Emirates, whose operation was commissioned to Seoul National University Hospital from 2015. As above, Korean telemedicine service is generally promoted by the connection between overseas governments and specific large domestic hospitals under the policy intended to expand medical care for overseas patients. Large domestic hospitals provide remote medical services similar to telemedicine services by opening telemedicine centers through medical tourism centers and local hospitals located overseas. Currently, domestic small and medium-sized hospitals (e.g. plastic surgery, dermatology and oriental medicine clinics) mainly focus on remote consultation using phone, e-mail, and social media for the purpose of attracting overseas patients into Korea [10].

2.3 **United Theory of the Acceptance and Use of Technology**

The first theory intended to explain the phenomena of accepting new technologies is the Technology Acceptance Model (TAM) suggested by Davis [11]. This model was developed to apply the relationship between beliefs, attitudes, intentions and actions to the acceptance of technology based on theory of rational behavior. The TAM has been verified as a representative model with high explanatory power in numerous technology acceptance studies since it was suggested. On the other hand, controversy over the limitations of the proposed model in the organizational context and the inability to sufficiently reflect the influence of various exogenous factors has been raised steadily. As a supplement to this, Venkatesh et al. [12] suggested a new technology acceptance model (UTAUT: Unified Theory of Acceptance and Use of Technology) from an integrated perspective, but this model also focuses on the factors influencing organization members’ acceptance of information technology.
Since then, Venkatesh et al. [13] also presented the UTAUT2 (Extended Unified Theory of Acceptance and Use of Technology) model that could better explain the process of accepting and using technology by general consumers. In UTAUT2 model, 3 factors (i.e. hedonic motivation, price value and habit) were added to the 4 core factors of the existing UTAUT model (i.e. performance expectancy, effort expectancy, social influence and facilitating conditions) and these factors have been confirmed to be critical variables in the results of recent researches using these factors [14–17].

2.4 Perceived Risks

The perceived risk initially suggested by Bauer [18] is the risk perceived subjectively in the situation where consumers have multiple choices, referring to the uncertainty and negative consequences that consumers feel when they cannot predict the outcome of their actions. In other words, psychological discomfort and anxiety occurring as a result of consumers’ perception of risk negatively influence the evaluation of product or service, which may, in turn, directly influence the acceptance and purchase of products and services [19]. Prior studies on the acceptance of technology applying perceived risk suggested that the perceived risk reduces perceived usefulness and intention to use and adopt, supporting the above argument [20–22]. The influence of risk perception is more prominent in the situation of the purchase of services than in tangible products and medical services are particularly high-risk services that make it difficult to predict the quality of services until they are experienced [23]. The telemedicine services using various information and communication technologies as a medium are basically exposed to an open environment of so-called online, which may make security main risk factors (e.g. hacking, errors, and personal (biometric) information leakage). In addition, on account of the non-contact interactions between medical staff and patients, the accuracy of communication, diagnosis, prescription and resulting problem-solving issues may act as risk factors.

3 Research Model and Hypotheses

This study intends to investigate the factors influencing the intention of potential overseas customers to use the telemedicine services to expand telemedicine services, which are spreading as a new method of supplying medical services, into overseas markets. Therefore, in this study, the UTAUT2 model was selected as a basic theoretical framework and new factors that could influence the use intention were added to design a model for accepting Korean telemedicine services.

In this study, the 5 main factors set to influence the intention to use Korean telemedicine services were ‘performance expectancy’, ‘effort expectancy’, ‘social influence’, ‘price value’ and ‘perceived risk’. But the ‘hedonic motivation’ and ‘habit’
factors in the UTAUT2 model were not reflected in this study because it was considered that the level of technological support expected at a personal level would not greatly promote or delay consumers’ use of telemedicine on account of the service supply path provided through medical institutions and telemedicine centers equipped with many telemedicine systems, except for medical consultations that consumers mainly use using mobile. In addition, ‘hedonic motivation’ and ‘habit’ were eliminated from the influencing factors in consideration of the essential characteristics of medical treatment directly associated with human health and the situational characteristics of the commercialization stage of telemedicine. As there are a number of potential risk factors (e.g. threats to the health rights of patients and leakage of personal (biometric) information due to remote medical services), which was predicted to directly influence the user’s intention to use, the perceived risk factors were added to the influencing factors for analysis. Figure 1 shows the research model of this study.

4 Research Method

4.1 Data Collection and Analysis Method

In this study, general consumers in China and Vietnam were selected as potential users of Korean telemedicine services, and a survey was conducted using a random sampling method. The online survey was conducted for two weeks starting from
Table 2  Sample characteristics

| Item            | Sample size | Ratio (%) | Total |
|-----------------|-------------|-----------|-------|
| Country         |             |           |       |
| China           | 151         | 48.7      | 310   |
| Vietnam         | 159         | 51.3      | 310   |
| Gender          |             |           |       |
| Male            | 111         | 33.4      | 310   |
| Female          | 199         | 59.9      | 310   |
| Age             |             |           |       |
| 20’s            | 143         | 43.1      | 310   |
| 30’s            | 126         | 38.0      | 310   |
| 40’s            | 36          | 10.8      | 310   |
| More than 50    | 5           | 1.5       | 310   |
| Final education |             |           |       |
| High school     | 32          | 9.6       | 310   |
| College         | 58          | 17.5      | 310   |
| University      | 149         | 44.9      | 310   |
| Graduate school | 71          | 21.4      | 310   |
| Job             |             |           |       |
| Office work     | 79          | 23.8      | 310   |
| Production occupation | 17  | 5.1 | |
| Professional occupation | 19  | 5.7 | |
| Student         | 105         | 31.6      | 310   |
| Official        | 55          | 16.6      | 310   |
| Self-employed   | 35          | 10.5      | 310   |

Jul 2, 2020, and finally 310 copies of data were used for analysis. In addition, 7-point Likert scale was used to measure the responses to questions and SPSS 23.0 was used for statistical analysis. The demographic characteristics of the sample group are summarized in Table 2.

4.2 Operational Definition of Variables

This study has selected ‘performance expectancy’, ‘effort expectancy’, ‘social influence’, ‘price value’ and ‘perceived risk’ as the main factors influencing the intention of overseas consumers to use Korean telemedicine services through literature review and listening to expert opinions; analyzed the relationship between the factors; and additionally analyzed the moderating effect of personal characteristics (i.e. innovativeness and concern for health) between these factors and the use intention. The operational definitions of the main variables selected in this study are listed in Table 3.
Table 3  Operational definition of variables

| Variable            | Operational definition                                                                                                                                                                                                 | Source     |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Performance expectancy | The extent to which the use of Korean telemedicine service is believed to be able to help achieve the expected purpose of use                                                                                           | [12, 24]  |
| Effort expectancy    | The extent to which Korean telemedicine services are believed to be easy to use                                                                                                                                                 | [12, 25]  |
| Social influence     | The degree of belief that the reference group will consider Korean telemedicine services positive and recommend to their acquaintances the use of Korean telemedicine services                                          | [12, 26]  |
| Price value          | The extent of satisfaction from using Korean telemedicine services compared to the cost to pay for the use                                                                                                                   | [14, 27]  |
| Perceived risk       | The possibility of perceived loss from using Korean telemedicine services                                                                                                                                                   | [28, 29]  |
| Innovativeness       | Individual's disposition or willingness to quickly experience new technologies and services                                                                                                                                     | [20, 30]  |
| Concern for health   | The importance of health and the extent of concern for health that individuals feel                                                                                                                                            | [31, 32]  |
| Use intention        | The intention or plan to use Korean telemedicine services now or in the future                                                                                                                                               | [11, 12]  |

5  Research Results

In this study, multiple regression analysis was conducted to test the hypotheses, and the analysis results are listed in Tables 4 and 5. As a result of the analysis, it was found that the performance expectancy, social influence, price value, and perceived risk had a significant influence on the intention to use Korean telemedicine services. In addition, as a result of analyzing the moderating effects of innovativeness and concern for health, it was found that both innovativeness and concern for health had

Table 4  Results of hypotheses tests

| Factor            | Use intention |   |   |   |
|-------------------|---------------|---|---|---|
|                   | B  | β   | t  | p  |
| Performance expectancy | 0.055 | 0.176 | 3.764** | 0.000 |
| Effort expectancy | 0.054 | 0.031 | 0.571 | 0.569 |
| Social influence | 0.057 | 0.305 | 5.273** | 0.000 |
| Price value | 0.057 | 0.344 | 6.094** | 0.000 |
| Perceived risk | −0.039 | −0.110 | −2.959** | 0.003 |
| R²                | 0.650         |   |   |   |
| F                 | 112.418**     |   |   |   |

Note  *p < 0.05, **p < 0.01
| Path   | Moderator       | β    | t     | p     |
|--------|-----------------|------|-------|-------|
| PE → UI | Innovativeness  | 0.657| 2.968**| 0.003|
| EE → UI |                 | 0.073| 0.323| 0.747|
| SI → UI |                 | 0.101| 0.444| 0.657|
| PV → UI |                 | 0.001| 0.003| 0.998|
| PR → UI |                 | −0.332| −1.274| 0.204|
| PE → UI | Concern for health | 0.572| 2.466*| 0.014|
| EE → UI |                 | 0.054| 0.250| 0.803|
| SI → UI |                 | −0.046| −0.213| 0.831|
| PV → UI |                 | −0.099| −0.424| 0.672|
| PR → UI |                 | −0.521| −1.873| 0.062|

Note *p < 0.05, **p < 0.01

a moderating effect on the relationship between performance expectancy and use intention (t = 2.968, p = 0.003/t = 2.466, p = 0.014).

6 Conclusions

With the outbreak of COVID-19, the telemedicine is attracting more attention than ever as it emerges as a safe and efficient method of supplying medical services. As a basic study for the overseas expansion and promotion of telemedicine services that are not allowed in Korea, this study was intended to investigate the factors influencing the intention to use Korean telemedicine services from the perspective of potential overseas customers. To this end, this study has tested the influence relationship by reconstructing the UTAUT2 model suggested by Venkatesh et al. [13] to be suitable for the studies on the acceptance of telemedicine services. The analysis results of this study can be summarized as follow.

First, it was found that performance expectancy, social influence, price value, and perceived risk had a significant influence on the intention to use Korean telemedicine services. The significant influence relationship between performance expectancy and intention to use has been proven in various studies on the acceptance of information technology including the telemedicine [29, 33, 34]. Therefore, it deems necessary to actively promote the usefulness of Korean telemedicine services and develop its image based on the advices of medical experts and tests. In addition, management and response strategies to remove or mitigate risk factors must be established within the organization through the process of identifying risk factors perceived by consumers in detail and predicting the consequences of risk according to the source.
Second, it was found that price value and social influence, in particular, greatly influence the intention to use. Since these results indicate that the opinions of neighbors and recommendation to them can be effectively used in the strategies for promoting Korean telemedicine services, it is necessary to promote marketing strategies that encourage sharing experience through Internet media and actively support acquaintance recommendation programs. In addition, it was also found that overseas consumers feel sensitive to the cost they will pay for using Korean telemedicine services. This implies that establishing a rational cost strategy through meticulous comparison of medical expenses in the local market and the telemedicine service products provided in competing countries will become a key factor in expanding the bases of overseas markets.

Third, it was found that the effort expectancy did not significantly influence the intention to use Korean telemedicine services, being consistent with the results of the study conducted by Choi et al. [16]. Given the fact that many of the survey subjects are potential customers who have not actually used telemedicine services and most of the telemedicine services, except for mobile medical consultations, are provided at special institutions (e.g., medical institutions and telemedicine centers), the difference in the extent of individual consumer’s effort to use the telemedicine service is considered to be less relevant to the actual use.

Fourth, it was found that concern for health and innovativeness have a moderating effect on the relationship between performance expectancy and intention to use Korean telemedicine services. Accordingly, the need for an opportunity to directly and indirectly experience Korean telemedicine through international fairs related to beauty and health and promotion strategies for Korean telemedicine service products that target users of healthcare-related devices and platforms is emphasized.

For the limitations of this study and future research directions are as follows. First, since a comprehensive survey was conducted without distinguishing the nationality (China, Vietnam) of the survey subjects, this study has limitations in generalizing the study results. Second, this study has limitations in that it did not comprehensively reflect various factors influencing the intention to use Korean telemedicine services, an extended study to supplement these limitations will be required in the future.

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