

Geographical Characteristics and Patients' Determinants of Online Referrals : A Case Study of Choongbook, Korea*

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온라인 협진에 대한 지리적 특성과 환자의 결정에 관한 연구 :
충청북도 사례를 중심으로*

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Abstract : This study employs qualitative approaches to examining geographical characteristics and patients' determinants of online referrals in terms of regionalization. In this light, I conducted interviews with 20 patients receiving online referrals in Choongbook, Korea, and investigated their behaviors regarding these referrals between July and August 2009. I found that many patients who suffered from various levels of illness preferred tertiary care centers outside of Choongbook and did not enjoy their experience with the local medical institutions as the online referral service sites. This result might be because patients choose online referrals for psychological considerations such as quality and level of health care services, personal stakes in online referral service sites, acceptability and credibility of good tertiary care centers, and easy access to and use of medical institutions. Meanwhile, immediate benefits with regard to the technological value of online referrals, such as convenience, utility, and original purpose associated with regionalization, did not influence patients' decision-making. Therefore, the social and public networks affiliated with online referrals plus the effect of Korean medical laws play hostage to private decisions made by citizens, who prefer high-level medical institutions. Accordingly, the technological contribution of online referrals does not halt the outflow of patients from local, tertiary care centers. Especially, the existing health care system and patients' behaviors are deeply related to referrals in the online system. To protect regionalization, the improvement of health care services from the present state of affairs is required.

Key Words : online referrals, telemedicine, regionalization, patients' determinants, geographical characteristics, Choongbook, Korea.

요약 : 본 연구는 충청북도의 사례를 통해서 온라인 협진의 지리적 특성과 환자의 온라인 협진에 대한 결정 요인에 대해 알아보는 것을 목적으로 하고 있다. 2009년 7월부터 9월까지 심층 인터뷰에 기반한 정성적 기법을 이용하였고, 충청북도에 거주하는 환자 20명을 대상으로 하였다. 이 연구에 의하면 대부분의 환자는 1차적으로 의료 문제가 해결되지 않을 경우, 온라인 협진의 본래 취지와 달리 충청북도 내에서 그것을 해결하는 것이 아니라, 경기 의료권에 위치한 의료 기관으로 방문하는 경향을 보였다. 이와 더불어, 환자의 의무 기록 또한 온라인 시스템을 통해 이들 병원에 전달되어, 온라인 협진의 공간상 네트워크는 경기 의료권으로 집중하게 된다. 이러한 주요 원인은 의료 서비스에 대한 질 혹은 수준에 대한 고려, 개인적인 이해 관계와 신뢰성, 좋은 접근성 등에 기인하는 것으로 밝혀졌다. 이에 반해, 온라인 협진 시스템의 편리성, 유효성 등과 같은 온라인 협진의 기술적 가치나 온라인 협진의 본래적인 목적인 지역 의료 향상과 같은 요인은 크게 영향을 미치지 않는 것으로 밝혀졌다. 따라서 우리나라 원격진료의 결정 요인은 환자 개인에 의해서 결정이 되는 바가 크고, 아직 개개인의 인식이 지역 의료 시스템과 크게 밀착되지 않는 형태를 보이기 때문에 경기 의료권으로 원격진료의 선택이 집중된 공간 특성을 보이고 있다고 할 수 있다. 특히, 이는 기존의 의료 제도 및 환자의 행태가 온라인 상에서의 의료 활동에도 그대로 투영되기 때문인데, 가장 이상적인 원격진료의 지리적 담론인 지역화를 실현하기 위해서는 근본적인 지역의 의료 서비스 구조의 개선이 필요할 것으로 보인다.

주요어 : 온라인 협진, 원격진료, 지역화, 환자의 선택과 결정 요인, 지리적 특성, 충청북도

1. Introduction

Telemedicine refers to the exchange of medical information from one site (medical institution) to

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another via electronic communications and services for diagnosis, therapy, and education for many purposes in health care (American Telemedicine Association, n.d.; Shannon, 1997; Lucas, 2008; Norris, 2002). Especially, the contemporary technologies of telemedicine are extending its coverage to provide various usage such as medical treatment, physical examination, medical education, medical conference, data control for patients' medical records, etc. In this sense, telemedicine is often used to avoid the costs and dangers of transporting patients to distant medical institutions and to ameliorate inadequate access to health care (Graham and Marvin, 1996; Shannon, 1997; Mitchell, 1999; Warf, 2000; Norris, 2002; Hayashi, 2005). Further, researchers in the field of telemedicine anticipate the development of transferring medical information among regions—and even across nations—without regard to geographical boundaries (Cutchin, 2002).

Despite these advantages, telemedicine is only seen as an ancillary method of online health care delivery in practical terms because of the dearth of empirical verifications and potential limitations. In addition, many countries stipulate that patients must see medical specialists in person at least once to avoid an incorrect diagnosis via the online system (Tanriverdi and Iacono, 1999; Oudshoorn, 2009). As a result, accessibility to and the utilization of medical institutions are as considerable as ever in telemedicine. In geography and related fields, the current research has suggested alternative theories and has introduced regionalization as one of the practical measures (i.e., management, regulation, investment) in the existing spatial theories of health care with regard to regionalization and using telemedicine within a potential geographic boundary (Cutchin, 2002; Shannon *et al.*, 2002).

Similarly, telemedicine in Korea has been used to disseminate medical information intermittently

since the 1980s, and its use has steadily increased as a supportive technology within the health care system (Choo, 1999; Ministry of Health and Welfare in Korea, 1996; Yoo, 1999). In particular, online referrals as a health care delivery system have an advantage over other telemedical technologies and promote the electronic use of delivering health care between tertiary care centers and primary care physicians within the potential geographical boundary at the tertiary care level. Accessibility to and the cost effectiveness of health care was expected to improve through sharing medical records on the Web via this system. Further, the provision of vital information, alerts, and guidance to doctors and medical specialists through this system was anticipated to lead to further improvements in access, quality, cost and equity.

Nevertheless, assessments on the geographical ramifications of online referrals remain unexplored. Especially, there has been minimal research regarding it in spite of some traits in the Korean health care system: there was no strict or strong geographic binding force to patients' decisions towards online referral service sites and entire decisions of online referral service sites were made predominantly by patients. And before operating the health care delivery system, the centralization of a lot of patients has been blamed for one of serious problems in health care. Therefore, many patients may have various reasons in the decision of online referrals. In this respect, through interviews with 20 patients being referred within Choongbook, Korea, this research uses qualitative methodologies drawing upon more immediate and scrupulous surveys to elucidate the decision-making characteristics of patients as critical decision makers and immediate beneficiaries of online referrals, including their decision-making propensities, those processes and determinants, and how the patients' geographical selections influence regionalization.

2. Telemedicine in terms of regionalization

Telemedicine has frequently been noted in geography and related fields but has rarely been studied in depth. The dearth of research on this subject is likely a result of the considerable complexities involved with telemedicine such as considering the relationship of health care with welfare or other public interests, technology, and even economic implications; the system is continually advancing. Therefore, it is not easy to obtain a clear geographical consensus with regard to telemedicine (Abou-Shaaba and Naizy, 1991; Reid, 1996; Capalbo and Heggem, 1999; Cutchin, 2002; Glasgow, 2002; Shannon *et al.*, 2002; Mihara, 2004; Gilbert, *et al.*, 2008). However, a few studies have reported that regionalization is viable and preferable (Cutchin, 2002; Shannon *et al.*, 2002; Nguyen, *et al.*, 2010). Regionalization, with regard to health care, refers to the purveying of medical services being delegated to a specialized local office and to local organizations within well-defined geographical boundaries (Mills, 1990). The same terms apply to telemedicine. Telemedicine is associated with cyberspace or placelessness (Dyb and Halford, 2009) and is, therefore, not beholden to physical restrictions or geographical considerations. Thus, regionalization might seem irrelevant in a discussion about telemedicine. However, the following three reasons show why regionalization is a key geographic factor in telemedicine.

First, though a complete shift from offline to online care seems plausible and attractive, telemedicine requires further studies regarding its related technologies and potential limitations, including language barriers, time limitations, infrastructure-related geographical restrictions and the limited availability of telemedicine from a practical standpoint (Cutchin, 2002; Norris,

2002; Shannon, 1997; Tanriverdi and Iacono, 1999; World Health Organization, n.d.). For example, telemedicine is most widely used for medical examinations through interviews, which is associated with the dangers of indirect medical interactions such as time delays or language barriers. Moreover, health care itself is strongly associated with face-to-face interactions between medical specialists and their patients rather than interactions with a coded system that is available online (Andrews and Kitchin, 2005). Further, many countries stipulate that patients must see medical specialists in person at least once to avoid an incorrect diagnosis through this system. Thus, it is commonly accepted that telemedicine is regarded as an auxiliary medical innovation instead of a replacement for in-person examinations (Reid, 1996). Accordingly, one of the existing optimal spatial theories in health care delivery (regionalization) plays an important role in telemedicine.

Second, while developing its technologies, telemedicine has connected multifariously to other domains of information sharing in the health care industry, including the control, management, and analysis of medical records for the provision of clinical, administrative, and educational services (Braa and Hedberg, 2002; Grimson, 2001; Mäenpää *et al.*, 2009; Norris, 2002; Lucas, 2008; Solomon, 2007). The collection of medical records via telemedicine is standard on the national and global scales, but information systems are tied up in a complex web of social and technical interactions, including racial segregation, social strata, and conflict among regions (Braa and Hedberg, 2002). The regional-based telemedicine system, which encompasses the optimal geographic area to control and enhance these systems, has been emphasized within a context whereby the process of related systems is developed from the bottom up. For example, medical records contained

within the telemedical system can aid in emergency situations because paramedics refer to these records when administering first aid to their patients (Wang *et al.*, 2009). These records can also be used in the analysis of epidemics or chronic diseases in a certain region and can aid in both disease prevention and the provision of better public health care. Moreover, medical records are not only used in medical institutions but also in pharmacies, gyms, schools, companies, and other institutions to improve health care in residents' home areas.

Third, as with general health care, profits derived from telemedicine are not confined to fixed diagnostic areas. Health care, including telemedicine, has two opposing characteristics: effectiveness, which is an economic factor, and equity, a factor that concerns the public interest (Smith, 1977; DeVerteuil, 2000). That said, the most important problem related to health care is how to successfully balance the competing needs for equity and efficiency in delivering public health care. Generally, this question comes down to the diagnostic boundary with regard to regionalization, which encompasses those living within a certain radius of a facility, and which many countries have incorporated into health laws related to their health care delivery system (Mills, 1990). Considering that telemedicine generally appears to center on existing medical institutions instead of new facilities and is conducted under the established health care delivery system, it is necessary to maintain the diagnostic area of each medical institution and to ensure offline delivery of services by the existing hospitals and clinics, only using online capabilities to extend services to distant areas (Norris, 2002). Confining medical incomes to only one diagnostic area might lead to a broad-scale breakdown of alternative diagnostic areas, which may threaten the balance of effectiveness and equity of health care because

profits are directly associated with the offline health care system upon which telemedical health care is dependent.

Regionalization is not a new idea in medical geography (Shannon *et al.*, 2002). Regionalization was suggested as an answer in many vigorous discussions on how to cope with the conflict between equity and efficiency in health care through geographical ideas (Smith, 1977; DeVerteuil, 2000). Many countries have adopted this concept in their health care delivery policies (Mills, 1990). Telemedicine also utilizes regionalization as previously discussed. In this sense, regionalization can help define a region according to social and medical circumstances within a diagnostic boundary with regard to health care delivery.

Likewise, online referrals in Korea are monitored by medical laws pertaining to health care delivery and are dispersed through tertiary care centers; medical institutions as online referral service sites assume the responsibility for regional health care. Further, the availability of online referrals corresponds with promoting regional health care within a potential geographical boundary at the tertiary care level. However, the concept of the family medical system as a fixed consultant of health care is relatively weak in Korea. Crucial decisions are made by patients themselves. Moreover, because the legal binding force of online referrals is relatively weak, patients can go to medical institutions as online referral service sites without considering geographic boundaries and are free of the burdens of distance or travel time. Therefore, patients are generally influenced by the increased accessibility of specialists, by shorter travel times and by reduced waiting times offered via telemedicine (Mair and Whitten, 2000).

Besides, according to some results, the affinity between telemedicine and the existing health care services has been discussed in various ways.

Especially, those results mentioned that telemedicine is influenced by the traditional forms of health delivery considerably; moreover, there is no difference between a telemedicine group and a traditional group (Gilmour, 1998; Demiris *et al.*, 2004; Whitten and Love, 2005). Therefore, it is possible that patients in Korea show unique tendencies towards online referrals considering the traits of the referrals. In this sense, ascertaining the geographical characteristics of online referrals and the decision-making characteristics of patients in Korea are well worth further considerations.

3. The online referral system in Korea

The concept of the “referral system” as related to health care delivery in Korea emerged in 1989. Policy makers intended for this system to prevent the overflow of patients visiting general hospitals as tertiary care centers, to stabilize public health finances and to develop balanced health care services throughout Korea (Ministry of Health and Welfare in Korea, 1996; Lee and Kim, 1997; Yoon, 1997). The plan focused on the relationship between primary or secondary medical institutions and tertiary care centers. With the public interest in mind, the system was structured so that hospitals and clinics could share medical records within the potential boundary. In the beginning, the referral system was based on a traditional “hands-on” or “paper-based” health care practice, but there have been several changes to the practice since the mid-1990s, such as the advent of the online referral system.

In 1995, the Asan Medical Center became the first health care center to use the online referral system, and the system’s operations have been replicated across the country by interlocking medical information technologies such as the

Picture Achieving Communication System (PACS) and Ordering Communication System (OCS), which paved the way for the dissemination of medical information. Korean medical laws permit medical interaction among doctors electronically and require patients to go to a hospital or clinic for an in-person diagnosis at least once to avoid misdiagnosis via telemedicine. Online referrals operate alongside the health care delivery system in each diagnostic region, and the intention of online referrals is to comply with the potential geographical boundary at the tertiary care level with regard to regionalization. Online referrals work in these contexts, and this system has expanded rapidly across the country because of its technological simplicity and convenience. Approximately sixty general hospitals are utilizing this system all over the county and it dominates the Korean representative telemedicine technology. Some countries such as U.S.A, Japan, and others in Europe have conducted experiments and applications for telemedicine for a long time and those results tend to utilize telemedical technologies like online referrals.

Online referrals and the transmission of health care delivery in an online format are conducted through both in-person and virtual interactions between patients, physicians, and medical specialists. Namely, physicians provide the medical records of patients who require special treatment at tertiary care sites to medical specialists through this system. Patients visit the tertiary care centers without any of their medical records on hand, and medical specialists can diagnose their conditions by referring to the patients’ web-based medical records. This protocol can prevent duplicated medical treatment and allow medical specialists to provide only essential medical treatments to patients. Likewise, medical specialists can update these patients’ records so that their primary care physicians can access their updated web-based medical records while

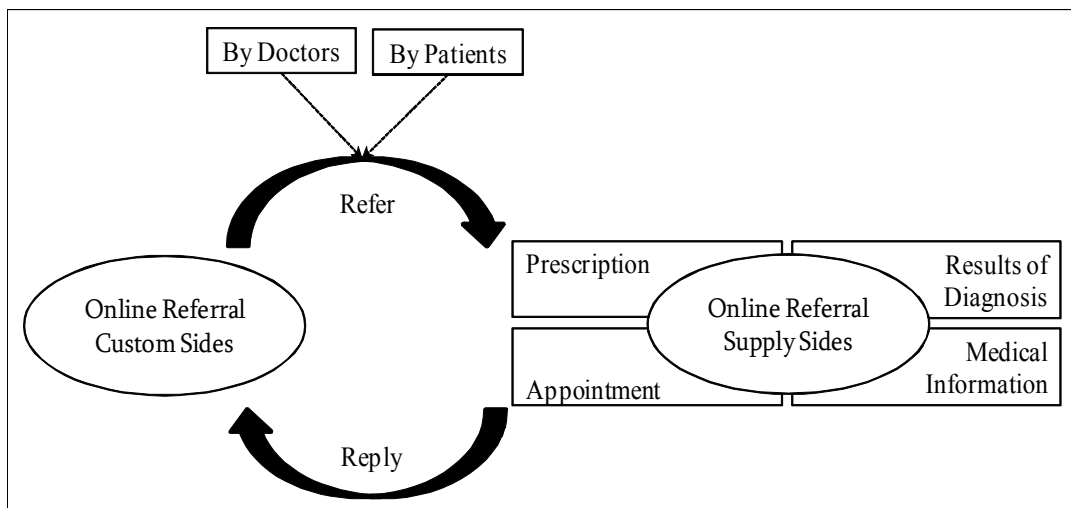


Figure 1. General mechanism of online referral in Korea

the patients continue to receive care from their physicians without the excessive burden of having to keep track of their own medical records. Through this mechanism, online referrals can prevent an overflow of patients in tertiary medical institutions and promote accessibility to and the use of other medical institutions despite the requirement that patients visit with a health care provider at least once in person (Figure 1).

The service content of online referrals varies according to the technology. This system commonly supports interactive communication among medical institutions. Namely, doctors use this system to make appointments with specialists for their patients or to input patients' medical records. Likewise, tertiary health care sites can offer medical information, including prescriptions, and they can share checkup results through images, video, audio, and sound files. Doctors can access this information when diagnosing patients referred to them from partnering institutions.

When considering online referrals, physicians can suggest the appropriate tertiary medical institutions for patients according to their conditions or other variables, but it is not a

final decision. In addition, patients can look for tertiary medical institutions and ask physicians to refer them to the medical institutions from which patients wish to seek medical advice. Replies from tertiary medical institutions to primary or secondary medical institutions operate the same way. The referral is beholden to medical laws, but it is not legally binding. In practice, patients play an important role in deciding to where they are referred or whether they will go directly to medical institutions, despite the burdens of accessibility to and utilization of medical institutions. In other words, there is no strong relationship between the medical laws and those practical binding forces for health care. In addition, the beginning of online referrals was originated by the management of general hospitals; therefore, even though online referrals are under the control of medical laws and regulations, online referrals have nothing to do with medical laws and regulations considerably.

4. Data and methods

Choongbook, the area under study for this

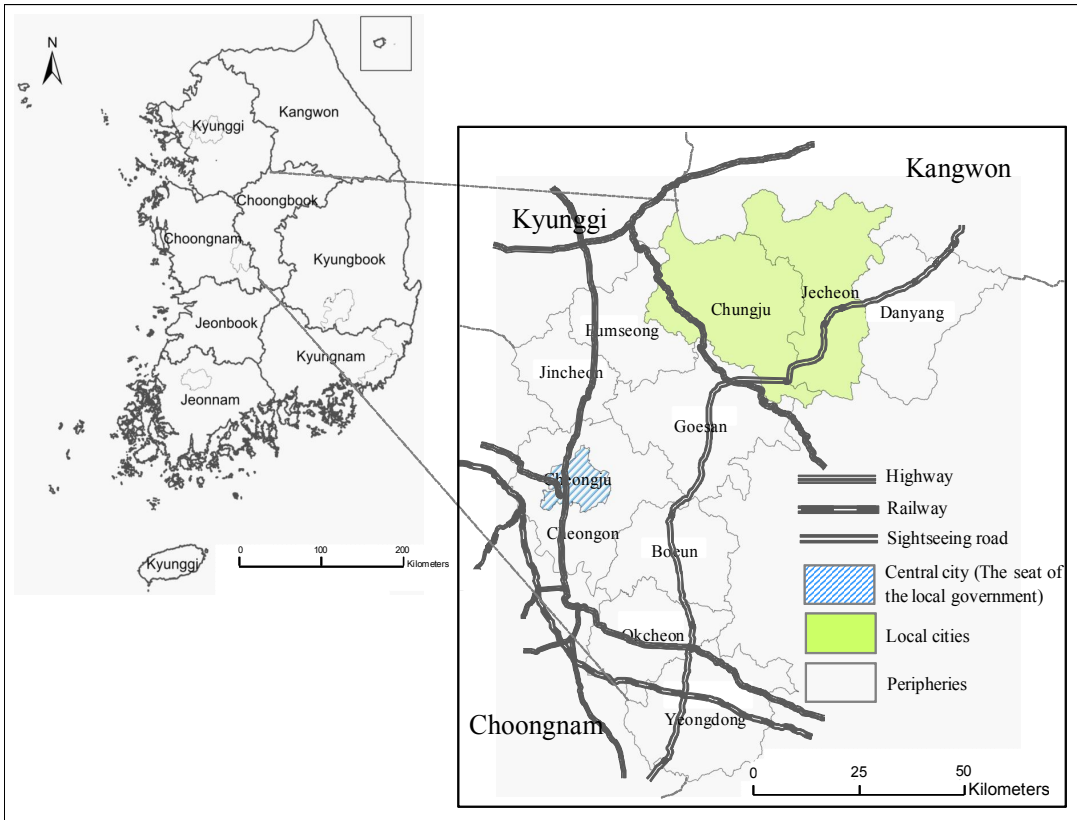


Figure 2. The diagnostic areas of Korea and the administrative districts of Choongbook

research, is located in the middle of eight diagnostic areas in Korea, based on living space and population size. The area closely borders Kyunggi, which includes Seoul, the capital of Korea. Choongbook is comprised of three urban areas and eight peripheries, including Cheongju, the seat of the provincial government of Choongbook (Figure 2).

According to Choongbook's social and medical indexes on a national scale, population and the gross regional domestic product do not play a dominant role in the Korea economy, and the indexes related to medical circumstances do not show these to be national priorities (Table 1). In Choongbook, there are ten general hospitals located in Cheongju, Chungju, Jecheon, and Okcheon. All of these general hospitals, except

for one, are clustered in urban areas, and the only general hospital managing online referrals is located in Cheongju. Accordingly, it can be estimated that the regional health care system in Choongbook does not provide affordable health care services to residents compared with the national level, as most of the areas in Choongbook are in peripheral areas rather than urban areas. In this sense, general hospitals in Choongbook have been providing online referrals to clinics to satisfy local residences. But Choongbook is near Kyunggi, including Seoul; therefore, a lot of patients may access to Kyunggi easily without any geographical barriers. All things considered, identifying Choongbook can contribute to extend our understanding on online referrals as a good example.

Table 1. Social and medical indexes in Choongbook

Category	Scale (Choongbook/All Diagnostic areas)
Population	1,512,157 (7/8)
Gross Regional Domestic Product (one million won)	32,175,365 (7/8)
Medical Institutions	2,306 (7/8)
Medical Workers	4,456 (8/8)
Medical Institutions per 100,000 people	151.0 (5/8)
Medical Workers per 100,000 people	291.7 (8/8)

Source: Populations from National Statistics in 2010, GRDP from National Statistics in 2009, Others from National Statistics in 2007

The data for this research are based on 20 patient interviewees as the sample group in Choongbook. I conducted in-depth and open-ended interviews of 20 patients between July 22, 2009 and August 3, 2009. The interviews were conducted in person and in the presence of the patients' family members or acquaintances based on snowball sampling (Mack *et al.*, 2005). Each interview lasted approximately one hour to one and a half hours. The discussions covered (1) residential area and medical insurance addresses in Choongbook; (2) online referrals by doctors of primary and secondary clinical sites in Choongbook and tertiary care centers visited within 2009; and (3) understanding the online referral system and its process regarding primary, secondary and tertiary medical institutions. This study intended to include patient participants who could respond to in-depth and open-ended interviews and whose family members or acquaintances could collaborate with the patients on their answers. Some interviews used a combination of patient opinions and family members' and acquaintances' observations. For example, one patient was suffering from Alzheimer's disease and did not have the ability to respond to the interview; therefore, his family members provided information regarding his activities and his opinions about the online referral instead. Lastly, two interviewees were health professionals in Choongbook (Table 2).

I chose interviewees equally from both urban and peripheral areas. Accordingly, ten residents were from urban areas in Choongbook, and the other participants were from the periphery. Six patients in their 20s, 30s, and 40s participated in this research. In addition, eight patients were in their 50s and six patients were 60 or older. To account for gender, I chose five female patients to participate in the study; the rest were male. Regarding income and academic background, most of the patient participants were not of a high social status. The average income of the participants fell between 1 million won and 3 million won monthly, and most of the participants were high school graduates. A few of the participants earned a high income or were college graduates, e.g. two patients have an income of over five million won and six patients were highly educated. There was no bias in choosing patient participants, but we can assume that the composition of the group is a result of Choongbook not being a major economic or administrative center in Korea. Participants in their 50s and 60s relied on their families financially. Eight patient participants were living with their families and only two patients lived alone. The patients suffered from serious and various chronic diseases. A referral from a doctor at a clinical site means that the patients needed in-depth medical examinations or special treatment by medical specialists. Accordingly,

Table 2. Patient demographics (n = 20) in Choongbook

Characteristics	Patient demographics (n = 20)
<i>Location</i>	
Major city	5 (25.0%)
Local cities	5 (25.0%)
Peripheries	10 (50.5%)
<i>Age Groups</i>	
Under 20	- (0.0%)
21-30	2 (10.0%)
31-40	2 (10.0%)
41-50	2 (10.0%)
51-60	8 (40.0%)
Over 60	6 (30.0%)
<i>Gender</i>	
Male	15 (75.0%)
Female	5 (25.0%)
<i>Income (one month)</i>	
< 1 million won	5 (25.0%)
1-3 million won	9 (45.0%)
3-5 million won	4 (20.0%)
> 5 million won	2 (10.0%)
<i>Family</i>	
Living together	18 (90.0%)
Living alone	2 (10.0%)
<i>Academic Background</i>	
< High-School graduate	4 (20.0%)
High-School graduate	10 (50.0%)
> High-School graduate	6 (30.0%)
<i>Decision-makers</i>	
Acquaintance	1 (5.0%)
Family	2 (10.0%)
Patient	10 (50.0%)
Doctor	2 (10.0%)
Patient and family	3 (15.0%)
Patient and doctor	2 (10.0%)
<i>Number of referrals</i>	
One	8 (40.0%)
Two	10 (50.0%)
Three	2 (10.0%)

Table 3. Geographical decisions of online referral

- | |
|---|
| <ul style="list-style-type: none"> • The patients first visit primary or secondary medical institutions • The location of the tertiary medical institutions referred by doctors via online referral • Transportation methods are determined and time is taken away from home to visit tertiary medical institutions • Length of stay in tertiary medical institutions (online-referral service sites) • Reply to primary or secondary medical institutions • Seriousness of patients' disease • Degree of patients' preference toward online-referral service sites • Satisfaction of patients in online-referral service sites • Referral and reply frequency via online referral |
|---|

their diseases varied and the patients have serious symptoms. Fifteen patients made their own decisions with regard to their preferred online referral service sites; far fewer of their decisions were made by acquaintances, family members, or physicians. Lastly, eight patients were referred by doctors only once; ten patients visited the tertiary medical institutions twice, five of whom were referred by doctors for the same disease; and two patients were referred by doctors three times. The multiple online referrals resulted from complications, patient dissatisfaction, or from the suggestion of tertiary medical institutions. I gave a variety of the responses according to the interviewees' answerback capabilities. Unanswered questions were made up for through additional surveys.

The methods used in this research are divided into two parts: 1) how and to where patients were referred by doctors in Choongbook; and 2) what determinants influenced online referral decisions. The former included questions such as: location of the primary or secondary medical institutions, location of the tertiary medical institutions, transportation methods and travel time required, length of stay, seriousness of patients' diseases, degree of patients' preferences towards online referral service sites, and satisfaction of patients in online referral services. Such questions can contribute to understanding the mechanism of online referrals and the related

medical activities (Table 3).

It is not yet feasible to make valid generalizations about the effectiveness of telemedicine, including online referrals, across disparate health services, technological configurations and settings (Grigsby *et al.*, 2005). However, the determinants were guided by evaluations from previous research on criteria in telemedicine, which examined clients' and patients' perspectives on health improvements, medical effectiveness, satisfaction, health care services and decreased travel including accommodations, transportation and other expenses (Coughlan *et al.*, 2006; Dávalos *et al.*, 2009; Hicks *et al.*, n.d.; Garshnek and Hassell, 2000; Mair and Whitten, 2000; Whitten and Love, 2005). In the research presented here, online referrals in Korea were investigated as a special case. As previous mentioned, the decision of patients in online referrals is associated with traditional activities for health care. Therefore, I added some provisions considering care conditions in Korea in terms of the selection of patients and tertiary care centers including kindness and convenience, good medical facilities including physical subsidiary facilities, the level and quality of health care services, recommendations of others, credibility and accessibility (Lee and Jang, 1988; Lee *et al.*, 1998; Kim *et al.*, 2004). General criteria included satisfaction with, level and quality of health care. Additional criteria related to patients' selection of tertiary

Table 4. Influences of online referral decisions

<p>Private dimensions^c</p> <ul style="list-style-type: none"> • Provision 1. Relative seriousness of disease ^{b, h} • Provision 2. Satisfaction of medical services ^{a, b, e, d (1999), f, h} • Provision 3. Private preference on tertiary medical institutions without considering seriousness of disease ^{h, i} • Provision 4. Private relationships with medical specialists or staffs (acquaintances) of tertiary medical institutions and, accordingly, various advantages ^{h, i} <p>Social^c and medical^h dimensions</p> <ul style="list-style-type: none"> • Provision 5. Image or awareness of tertiary medical institutions in Choongbook or other diagnostic areas associated with the appraisal of tertiary medical institutions ^{a, e, h, i} • Provision 6. Utilization of tertiary medical institutions (time or cost) ^{a, b, c, f, g, h, i} • Provision 7. Good medical services or strong attraction of tertiary care centers in other diagnostic areas ^{a, e, g, h, i} • Provision 8. Advantage of the online referral ^{d (2000)} <p>Geographical dimensions ^{h, i}</p> <ul style="list-style-type: none"> • Provision 9. Decrease of accessibility ^b • Provision 10. Development of the transportation system ^{g, h, i} • Provision 11. Poor distribution of tertiary medical institutions ^{h, i}

^a Coughlan et al., 2006

^b Dávalos et al., 2009

^c Hicks et al., n.d.

^d Garshnek and Hassell, 1999, 2000

^e Mair and Whitten, 2000

^f Whitten and Love, 2005

^g Lee and Jang, 1988

^h Lee et al., 1998

ⁱ Kim et al., 2004

care centers in Korea also considered private reasons or the change of social conditions in terms of geographical dimensions.

The criteria fell into three categories: private, social and medical, and geographical dimensions. Above all, a private dimension considered patients who make the final decisions regarding their treatment. I examined what patients think of the online referral system in areas such as seriousness of disease and satisfaction. The following parameters focus on social and medical aspects in diagnostic areas like Choongbook and are applicable to the external influences of online referrals: the images patients have and their level of awareness of tertiary medical institutions, the use of tertiary medical

institutions, the medical services provided by tertiary medical institutions and the advantages of online referrals. The third criterion I examined concerned geographical dimensions such as a decrease of accessibility via online referrals. Further, considering care in Korea, private preference to tertiary medical institutions was worth being included. Because the Korean society is composed of strong personal connections through school ties, regionalism and kinship, private relationships with medical specialists or the staff of tertiary medical institutions influence patients' decision making. Moreover, the development of a transportation system throughout Korea is one of the outstanding geographical changes related to

time-space compression. As previously mentioned, because there is only one online referral service site in Choongbook, it is worth examining the possibility of a poor distribution of tertiary medical institutions in the area. Further, a high population density (42.8%) exists in Kyunggi, including Seoul, and the fringe areas closely bordering Choongbook. Therefore, the distribution of medical institutions may reflect the population density and thus, was also considered in this research (Table 4).

5. Results

1) Geographical decisions regarding the online referral system

〈Table 5〉 shows the results derived from the first investigation detailing decisions regarding online referral service sites and how these variations and selections of online referrals influence the online referral process at the individual level. Referring patients to tertiary medical institutions means that these patients' physical conditions were serious and required accurate diagnosis by medical specialists. Further, the main subjects of this research were patients who were 50 years or older. Almost all of the participants had visited or were visiting tertiary medical institutions after online referrals from the first clinic they visited to receive medical treatment at least once as inpatients or outpatients because of various chronic diseases or serious illnesses.

Table 5. Geographical referral process dimensions

No.	Disease	Seriousness	Location for Primary or Secondary care	Regional Level		Inter-regional Level		Transportation /Time (min)	Length of stay	Reply	Preference	Satisfaction	Frequency (month)
				Choongbook	Kyunggi	Kangwon	Choongnam						
CH 1	Diabetes	M	Cheongju	→●				Public / 10	1	N	H	H	1
	Back pain	S	Cheongju	→●	→●			Private / 120	20	N	H	H	-
CH 2	Diabetes	N	Cheongju	→●				Private / 15	1	N	M	M	1
	Back pain	S	Cheongju	→●	→●			Private / 120	14	N	H	H	1
CH 3	Diabetes	N	Cheongju	→●				Public / 20	1	N	M	M	1
	Back pain	S	Cheongju	→●	→●			Public / 130	14	N	H	H	1
	Cold	S	Cheongju	→●	→●			Public / 20	3	N	H	H	-
CH 4	Stroke	N	Cheongju	→●				Public / 15	3	N	M	M	1
	Hypertension	N	Cheongju	→●				Public / 15	1	N	M	M	1
CH 5	Back pain	S	Cheongju	→●				Public / 15	20	N	L	L	-
	Back pain	S	Cheongju	→●	→●			Public / 120	1	N	H	H	2
CH 6	Cancer	S	Cheongju	→●	→●			Private / 150	14	N	H	H	1
	Cancer	S	Choongju	→●	→●	→●		Private / 15	21	N	M	M	-
CH 7	Cancer	S	Choongju	→●	→●	→●		Private / 150	14	N	H	H	1
	Back pain	S	Choongju	→●	→●	→●		Private / 15	7	N	H	H	-
CH 8	Heart Disease	S	Jecheon	→●	→●	→●		Private / 15	1	Y	H	H	-
CH 9	Cancer	S	Jecheon	→●	→●	→●		Private / 150	14	N	H	H	1
CH 10	Heart Disease	S	Jecheon	→●	→●	→●		Public / 40	1	N	M	M	-
	Heart Disease	S	Jecheon	→●	→●	→●		Public / 180	20	N	H	H	1
CH 11	Stroke	S	Danyang	→●	→●	→●		Public / 30	3	N	M	M	-
	Stroke	S	Danyang	→●	→●	→●		Private / 150	3	N	H	H	1
CH 12	Eye Disease	S	Danyang	→●	→●	→●		Private / 15	3	N	H	H	-
	Stomachache	S	Danyang	→●	→●	→●		Private / 120	1	N	H	H	-
	Cancer	S	Danyang	→●	→●	→●		Private / 120	14	N	H	H	1
CH 13	Alzheimer	S	Eumsong	→●	→●	→●		Private / 90	30	N	H	H	1
CH 14	Back pain	S	Jincheon	→○	→●	→●		Private / 20	1	N	M	L	-
	Back pain	S	Jincheon	→○	→●	→●		Private / 40	7	N	H	H	1
CH 15	Back pain	S	Jincheon	→●	→●	→●		Public / 150	14	N	H	H	1
CH 16	Cancer	S	Goesan	→●	→●	→●		Private / 100	3	N	H	H	1
CH 17	Diabetes	N	Goesan	→○	→●	→●		Public / 30	1	N	M	M	1
CH 18	Cold	S	Cheongju	→●	→●	→●		Private / 120	1	N	H	H	-
CH 19	Rheumatism	S	Boeun	→●	→●	→●		Private / 60	1	N	H	H	1
	Back pain	S	Boeun	→●	→●	→●		Private / 60	7	N	H	H	1
CH 20	Checkup	N	Okcheon	→●	→●	→●		Public / 60	1	N	H	H	-

Note: ○ means "referring patients to other areas within Choongbook (Cheongju as a major city)."

Seriousness - M: Minor, N: Normal, S: Severe / Preference and Satisfaction - H: High, N: Normal, L: Low

With the exception of patient CH 18, nineteen participants were referred by doctors at primary or secondary medical institutions located in the same residential districts in which the patients lived. Though CH 18 saw a doctor at a primary or secondary medical institution located in another residential district, CH 18 lived in Cheongwon, which is close to Cheongju. In other words, most of the patients chose primary or secondary medical institutions within their same residential district before being referred to tertiary medical institutions. With respect to the selection of online referral service sites, patients preferred tertiary medical institutions located in Choongbook to those outside the diagnostic area such as in Kyunggi, Choongbook, or Kangwon. However, 8 cases were referred to Choongbook, 16 cases were referred to Kyunggi, 6 cases were referred to Kangwon, and 4 cases were referred to Choongnam. The results showed a clear propensity of many of the patients to be treated in outside tertiary care centers rather than in the inside centers. Moreover, some patients were referred to different tertiary care centers for further medical attention.

According to the time required for transportation, it takes less than 30 minutes to travel to medical institutions within Choongbook. In contrast, it takes between 120 minutes and 180 minutes to travel to Kyunggi using private or public transportation methods. Additionally, though Choongnam and Kangwon are other diagnostic areas, it takes less than 60 minutes to travel from Choongbook to these areas using either private or public transportation. When patients visited tertiary medical institutions for the first time, they were only required to stay for one day. However, when they had an operation or other serious illness, they spent anywhere from 3 to 30 days at the medical institution depending on their health condition and disease.

Patients were referred to tertiary medical institutions via the online referral system. Most of the patients finished or continued their medical treatment in these tertiary medical institutions without returning to the primary or secondary medical institutions. Only one patient (CH 8) returned to a primary or secondary medical institution after being examined in a tertiary site in Choongbook. Preferences and satisfaction towards medical institutions as online referral service sites show a strong and direct correlation. For example, when preference is high, satisfaction is also high. Mostly, preference and satisfaction regarding medical care inside the district are low, and the opposite cases involving the inter-regional level's online referrals attain a high level. Some patients completed their medical treatment at tertiary care centers while other patients continued medical treatment at tertiary care centers. Patients visited tertiary care centers infrequently, on average going in for health care once per month.

Consequently, it is reasonable to assume that although the patients' choices and their decision-making processes regarding online referrals are multifarious, their overall propensities lean toward the outside tertiary care centers, not the inside ones. Accordingly, it is very hard to determine the geographical characteristics of telemedicine in terms of regionalization in Korea. Telemedical activities do not currently contribute to the regionalization of telemedicine in Korea as affairs stand.

2) Determinants on online referrals

(1) Private dimensions

Though few patients were referred to the tertiary medical institution in Choongbook, those who were seen at this location stated why they preferred this particular institution.

"Though my disease (diabetes) is not a minor illness needing tertiary medical care, I must take medicine for diabetes continuously, and medical treatment for diabetes in the tertiary medical institution in Choongbook is enough to cure my disease." (CH 1, Cheongju)

Patients going to the tertiary medical institution in Choongbook cited convenience and satisfaction with the service in Choongbook as their major reasons for choosing that site. In most cases, the patients went to tertiary medical institutions in other diagnostic areas and were satisfied with those medical institutions' attractive medical services. Because these tertiary medical institutions are top general hospitals (online referral service sites in Korea are managed by major universities or large companies), they can provide high-quality medical services to patients. In comparison to these medical institutions, the tertiary medical institution in Choongbook operates on a small scale and is the only one of its kind that is an online referral service site. Accordingly, many patients are more satisfied using the tertiary medical services outside of Choongbook.

"The distance from Choongbook to other diagnostic areas, in particular, to Kyunggi is not an important consideration to me. Because medical problems are a fact of my life, I want to receive medical treatment in the best medical institutions. There are good medical institutions managed by huge companies and major universities in other diagnostic areas, especially in Kyunggi. So I asked the primary care doctor to refer me to tertiary medical care sites in Kangwon and Kyunggi as much as possible." (CH 6, Choongju)

"Actually... I think that the level of health care services in Choongbook is not attractive to many patients. There are few tertiary medical care sites and besides, they are small."

(CH 14, Jincheon)

Elderly residents and those of a high social status tended to travel to tertiary medical institutions in other diagnostic areas, particularly Kyunggi. Though some patients returned to Choongbook, they wanted to continue their treatment at another diagnostic site. Moreover, some patients went to tertiary medical institutions even if they did not have a serious disease.

"My father suffers from cancer and back pain. When we chose a site for tertiary medical care, my father strongly suggested one. Maybe... my father's friends gave him information, and though it seems that people over 60 don't know anything, their frank discussions about their experiences at medical institutions are very animated." (CH 7 with his family, Choongju)

"Some patients who are of a high social status in Choongbook want to seek tertiary medical care in other areas even if they do not have a serious illness. Of course... my disease was not a simple cold. My cold developed into pneumonia and I needed more treatment. Though I could go to a tertiary medical institution in Choongbook, I am a pharmacist and am familiar with the medical situation in Choongbook. I am not satisfied with the health care in Choongbook so I finally selected a tertiary medical institution in Kyunggi." (CH 18 is a medical specialist in Choongbook, Cheongwon.)

Additionally, private relationships with medical specialists or staff members at tertiary medical institutions influenced patients' decisions regarding online referral sites.

"For example, seeing a well-known medical specialist or waiting for an operation in a tertiary medical institution is not easy. So, I asked an acquaintance at a tertiary medical

institute for treatment as soon as possible because... my medical problems are urgent. My acquaintance can give me various advantages such as a deduction in price.” (CH 9, Jecheon)

(2) Social and medical dimensions

Mostly, patients have a low opinion of the tertiary medical institution in Choongbook because of misdiagnoses and the site’s conservative atmosphere. Additionally, the outside tertiary medical institutions offer various medical services such as the regular transmission of reservation information to patients via telecommunication facilities that they can check online. Therefore, this aspect is one reason they prefer outside tertiary medical institutions over local institutions.

“A couple years of years ago, my mother suddenly passed away because of a misdiagnosis in the tertiary medical institution. There are many patients who have received a misdiagnosis in Choongbook... So I cannot trust the medical institution anymore, and instead, I seek tertiary medical care elsewhere. They send me information related to my regular medical treatment once a month, I naturally prefer tertiary medical institutions in other areas.” (CH 5, Cheongju)

“I wanted to be referred to the tertiary care center in Kyunggi rather than the closer one in Choongbook owing to time and cost. But the medical institution in Choongbook declined to refer me because they could not understand the previous medical treatment carried out by the clinic in Kyunggi. I now receive treatment regularly at the tertiary-care site in Kyunggi.” (CH 3, Cheongju)

With respect to the use of tertiary medical institutions, there is no difference between the local medical institution and those outside of Choongbook. Because going to tertiary medical

institutions requires an entire day, patients feel the same burden with regard to expenses anywhere they go. Therefore, though the physical distance from Choongbook to other diagnostic areas is not short, time spent and cost do not deter patients from seeking care outside of Choongbook.

“I expect a long wait to see a medical specialist at a tertiary-care institution and to spend a considerable amount of money. Though the transportation time between my home and the tertiary clinic in Choongbook isn’t long, the waiting time and other burdens for tertiary care in Kyunggi and Choongbook are the same. So, I don’t care where I go.” (CH 13 and her family)

“After introducing the online referral system, there is no red tape to prevent copying medical images or receiving referral documents from a doctor before going to a tertiary-care site. However, I do not feel the direct influence with regard to my medical treatment.” (CH 11, Danyang)

Only one patient returned to a primary care site after an online referral to a tertiary care site, and he had a positive experience. Therefore, the acceptability and credibility of tertiary care centers outside of Choongbook are high compared to the center in Choongbook.

“After finishing my medical examinations in the tertiary-care site in Kangwon, I was referred to a clinic through an online referral. I need medicine for my heart and don’t have the time or the money to go to the tertiary-care site anymore. So, I go to a clinic regularly and receive a prescription for heart medication. It seemed that the doctor referred to my previous examination results when diagnosing me. I think it is convenient.” (CH 8, Jecheon)

(3) Geographical dimensions

I conducted research in terms of geographic parameters. No relationship between online referrals and the decrease of accessibility in Kyunggi or outside the area was found based on the patients' decisions, and almost none of the patients returned to local medical institutions. Additionally, some patients revealed that the development of the transportation system in Choongbook was another reason that they could easily go to tertiary medical institutions in other diagnostic areas. Further, some patients in the outskirts of Choongbook, such as Choongju, Jecheon, Danyang (the east part), Boeun, and Okcheon (the south part), felt it was more convenient to visit tertiary medical institutions outside of Choongbook rather than the one in Choongbook because the outside diagnostic areas are closer than the administrative district of those areas affiliated with Choongbook.

"The recent development of transportation from Choongbook to Kyunggi is worth noting. Not long ago, it took more than two hours to travel from Choongbook to Kyunggi. Now, however, it takes one hour and thirty minutes." (CH 15, Jincheon)

"I prefer to go to tertiary medical institutions outside of Choongbook because the best tertiary-care site is in Kangwon and is closer than the one in Choongbook." (CH 12, Danyang)

Further, many patients mentioned that the poor distribution of tertiary medical institutions that are adequate online referral service sites is the main reason that regionalization of telemedicine is not currently recognized in the Korean health care system.

"My son suggested that I get a regular checkup at the tertiary-care institution in

Choongnam. Of course, the one in Choongnam is closer than the one in Choongbook, and there are no tertiary-care centers that offer examinations for cancer. So when deciding to go to a tertiary-care center, I prefer to go to the one in Choongnam." (CH 20, Okcheon)

"Basically, my preference for tertiary care outside of Choongbook is because of the poor distribution of tertiary-care centers. Major medical institutions agglomerated in Kyunggi, Choongnam and Kangwon have several good tertiary-care institutions. Regrettably, there are few tertiary-care centers in Choongbook that serve the public well." (CH 16 is a medical specialist in Choongbook, Goesan)

As previously mentioned, Choongbook is ranked as a poor diagnostic area for health care services; therefore, this fact is associated with online referrals as well. As a result, it is improbable that the online referral system depends on geographical aspects such as accessibility or distribution of medical institutions yet in Choongbook.

6. Discussion and conclusions

Analysis conducted in this study was designed to scrutinize the geographical characteristics of online referrals related to regionalization and the decision-making characteristics and determinants of the patients towards online referrals. On the whole, the patients did not enjoy their experience at the local tertiary medical institution. Most patients showed a strong inclination to visit the tertiary medical institutions outside of Choongbook. Psychological considerations regarding the quality and level of health care services, personal stakes in online referral service sites, acceptability and credibility of good tertiary care centers and easy access to and the use of medical institutions are overwhelmingly associated with their deliberated propensities. The original intent of

online referrals with regard to regionalization, their technological value, convenience and utility were not considered important at this stage of telemedicine in Korea. Patients' desires to experience good medical services considering Korea's current level and quality of health care underlie the status quo in online referrals and influence their decision making.

In practical terms, the role of telemedicine in existing health care services has been discussed as far as acceptance, utilization, perception of risks and benefits, effectiveness and efficiency according to the target population concerned. In this sense, the findings between online referrals and the existing health care services are relevant. Past studies often indicate that the rates of expected satisfaction depend on the traditional forms of health delivery (Demiris *et al.*, 2004; Whitten and Love, 2005). Namely, it was claimed that there is no difference between a telemedical group and a traditional group when asking about overall care (Gilmour, 1998). Other findings contend that the high level of patients' satisfaction in rural settings appear when consulting with a specialist located in an urban, academic medical center (Frey and Bratton, 2002; Norris *et al.*, 2002). Overall, although this form of futuristic medicine erodes the traditional physician-patient relationship, it is expected to improve patient satisfaction, accessibility to physicians and patient outcomes. Moreover, care delivery may change, but the nature of care and medicine remains untouched (Frey and Bratton, 2002; Oudshoorn, 2009).

However, without considering the potential service boundary, unconditional telemedicine networks threaten the maintenance of telemedicine because of the aforementioned reasons: technological limitations, futuristic usage in various directions and profitability and usability in practical terms; therefore, regionalization as an intensive care unit and quality improvements

through regional outreach has colligated telemedicine (Nguyen *et al.*, 2010). Furthermore, unlike previous telemedical applications for rural and isolated communities (Reid, 1996; Capalbo and Heggem, 1999; Mihara, 2004), contemporary telemedicine is available everywhere including urban areas, and the value of regionalization in telemedicine has been embossed. The regionalization of telemedicine requires a central authority to implement and regulate the system, as well as specific legislation, investment in information technology, and financial incentives for providers (Nguyen *et al.*, 2010). Nevertheless, the implementation of regionalization in telemedicine in Korea faces serious obstacles related to the coordination and integration of health services in an unstructured environment despite the anticipated benefits (Shannon *et al.*, 2002). Only the huge investment in online referrals at the initial stage and related medical laws currently remain. Stubborn health care issues since the age of paper-based referral services have yet to be solved, and these complexities influence patients' decisions (Lee and Kim, 1997; Yoon, 1997; Park, 2004; Park, 2010). In other words, the chronic problem of health care services in Korea, which a lot of patients prefer be referring to general hospitals in Kyunggi, is reflecting in the geographical characteristics of online referrals; therefore, it requires the fundamental improvement of health care in particular the regional health care system.

The imbalance of health care services throughout Korea encourages patients' notions of preferring outside medical institutions to inside ones. Tertiary medical centers are located around Kyunggi, particularly in Seoul, in proportion to the population (22.5%). In addition, more than one half of all online referral service sites (54.9%), which are acknowledged as high-level tertiary care centers, are located in Kyunggi. Moreover, these medical institutions are included

in private sectors managed by large companies and universities instead of public institutions and have a profit-oriented bias. Although the medical institutions suggested this system themselves for regional health care, these online referral service sites accept patients willing to travel far for high-level health care without considering the original intent of online referrals. Additionally, extrinsic factors, such as a desire for a diagnosis from a good medical institution, enhanced quality of life and the development of transportation and communication, stimulate patients, particularly in local areas. Given these facts, it appears likely that although the existing health care system is associated with online referrals, the present phenomenon of online referrals threatens far more than it contributes to the balance of health care because of the application of online referrals without creating stable health care services in advance on a national scale. Accordingly, online referrals on the surface are contrary to regionalization. Further, most of the patients cannot return to the internal medical institutions, and thus the online referral system has changed from a two-way delivery system to a one-way delivery system.

Given the current situation of online referrals and the fact that the online referral system is free and nascent, this research suggests that online referrals in Korea have many improvements to consider in terms of its offline properties rather than online properties related to technological dimensions with regard to regionalization. Moreover, to be successful, implementation of regionalization in telemedicine requires not only various participants, but also cultural and social understandings as we identified in the results (Shannon *et al.*, 2002).

To date, there has been minimal research regarding telemedicine, including online referrals and regionalization; moreover, direct evidence or

a theoretical basis is not enough to explain patients' behaviors in not only the field of geography but also in related fields of telemedicine. In this sense, this discussion is limited in scope and further studies are required, in particular, in the development of various methodologies. However, it can be said that this research provides some observations about the early stages of online referrals in Korea. For more detailed geographical investigations, further studies are expected from providers and other stakeholders in online referrals.

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