IPRPD
International Journal of Business & Management Studies
ISSN 2694-1430 (Print), 2694-1449 (Online)
Volume 05; Issue no 06: June, 2024
DOI: 10.56734/ijbms.v5n6a3

INVESTIGATING PATIENT UNCERTAINTY IN VIRTUAL CONSULTATION: A CONTENT ANALYSIS STUDY

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Abstract

Despite the benefits of conveniences and flexibilities, widespread adoption of virtual consultation systems remains elusive among patients. This exploratory study aims to uncover the underlying reasons behind this phenomenon by investigating patient uncertainties about virtual consultation and their impact on patient satisfaction. Leveraging a content analysis methodology, we scrutinize patient-generated online reviews on five prominent virtual consultation platforms.

Our findings delineate the primary sources of patient uncertainty, ranked in descending order of significance: (1) ambiguity surrounding virtual consultation processes, (2) concerns regarding doctors' behavior, (3) challenges in articulating symptoms, (4) apprehensions regarding doctors' attitudes, (5) difficulties in understanding doctors, and (6) uncertainty about doctor's feelings and emotions. Moreover, our analysis suggests a potential link between heightened uncertainties and patient dissatisfaction, albeit contingent on various factors, including perceived benefits and how virtual consultation systems address patient uncertainties.

This study sheds light on the intricate dynamics of uncertainties in virtual consultations, providing valuable insights for researchers, system designers, and healthcare providers. By elucidating patient perspectives and apprehensions, our findings offer a roadmap for refining virtual consultation systems to mitigate uncertainties and enhance patient satisfaction, thereby advancing the quality and efficacy of telemedicine services.

Keywords

Virtual Consultation, Virtual Consultation Systems, Uncertainty, Satisfaction, Telemedicine, Healthcare, Information Systems

Introduction

Virtual consultation (VC) is a critical aspect of telemedicine, defined as the delivery of healthcare services at a distance using information and communication technologies (Saliba et al., 2012). Telemedicine encompasses three primary modalities: remote consultation, remote monitoring, and remotely supervised treatment or training (Klaassen et al., 2016). VC, also known as e-consultation, involves interactions between clinicians and patients via email, telephone, or video. It serves various purposes, including primary consultations, second opinions, telediagnosis, and administrative functions such as e-referrals (Caffery & Smith, 2010).

Despite its potential, VC has not been widely adopted for patient-doctor interactions. Recent data indicates a very low usage rate, with only 2.00 online consultations per 1,000 patients per month. The majority of these e-consultations pertain to administrative requests like test results and prescription refills (22.5%), with fewer consultations addressing clinical issues such as infections and immunological concerns (14.4%) (Edwards et al., 2017). This low adoption rate prompts researchers to investigate the underlying reasons, particularly for doctor-patient consultations.

One possible explanation for patients' reluctance to adopt VC is the inherent uncertainties associated with the process. Patients may be unsure about how to use a VC system, its reliability, the qualifications and ethics of the consulting doctor, and the protection of their privacy. These uncertainties stem from the nature of VC as a form of computer-mediated communication. While patient uncertainty is likely a significant obstacle to adopting VC, there is a paucity of research addressing these uncertainties in VC systems. This study aims to bridge this gap by exploring and elucidating the uncertainties patients perceive in VC systems.

This research has two primary objectives: first, to identify patients' perceived uncertainties and benefits of VC systems, and second, to examine how these perceived uncertainties influence patients' satisfaction with VC systems. Patient satisfaction is increasingly recognized as a crucial indicator of healthcare quality, reflecting what patients value, how they perceive the quality of care, and where improvements can be made (Pakdil & Harwood, 2005; Saad Andaleeb, 2001). Satisfaction is defined as a consumer's post-consumption judgment that a service provides a fulfilling experience, which includes emotional responses and perceived fulfillment (Oliver, 2014; Zineldin, 2006).

While perspectives from doctors, hospitals, or healthcare administrators are important, this study focuses exclusively on patients' views regarding VC systems. Evidence suggests that patients' primary concerns revolve around the quality, cost, and benefits of healthcare services (Greenhalgh et al., 2016; Santana et al., 2010). Patients may be skeptical about the accuracy of online diagnoses and the overall value compared to traditional face-to-face consultations. Consequently, VC providers face the challenge of understanding and addressing these patient concerns to increase satisfaction and adoption rates.

This study employs a content analysis of patient reviews of VC systems to answer the following research questions:

- What uncertainties do patients perceive while using VC systems?
- How are these perceived uncertainties related to patients' satisfaction with VC systems?

Content analysis of patient reviews provides a nuanced understanding of patient perspectives, revealing how and why patients perceive VC in specific ways (King et al., 2014; Qu et al., 2009). Practically, this study highlights the uncertainties and benefits of VC systems from the patients' viewpoint, providing insights that can help healthcare providers design better systems to enhance patient certainty and satisfaction. Understanding these aspects can also reveal the perceived advantages of VC compared to traditional face-to-face consultations.

Literature Review

Virtual Consultation

Technology-supported consultation in healthcare is increasingly viewed as a potential solution to the complex challenges of delivering healthcare to diverse populations, particularly those in rural areas (Greenhalgh et al., 2016). Telemedicine, or telehealth, leverages digital technologies to transmit high-definition video and audio signals for direct patient care, enhancing traditional face-to-face consultations (Brooks, 2016; Jue et al., 2017; Klaassen et al., 2016; Segato & Masella, 2017). Virtual consultation (VC), a vital component of telemedicine, allows patients to receive medical advice and treatment within their daily living environment (Ellenby & Marcin, 2015; Epstein et al., 2005; Klaassen et al., 2016; Yu et al., 2014).

Extensive research supports the effectiveness and efficiency of VC. Studies have highlighted its potential in various aspects, such as cost-effectiveness (Ferrigno et al., 2018; Hailey et al., 2002; Lee et al., 2017), improved healthcare access and quality (Doubova & Pã, 2018; Gallagher et al., 2017; Rosenzweig & Baum, 2013; Weinstein et al., 2014), and other advantages (Klaassen et al., 2016; McLean et al., 2013). These studies predominantly use outcome-focused approaches to evaluate the benefits of VC.

However, despite the promising results, there remains a paucity of research aimed at improving patient-clinician interactions through VC (Greenhalgh et al., 2016; Verlinde et al., 2012). Existing studies mainly employ experimental methods, particularly randomized controlled trials, to assess the usability of VC (Ellenby & Marcin, 2015; Greenhalgh et al., 2016; Reed, 2005). While these methods are valuable, there is a need for in-depth qualitative studies to explore the nuanced interactions between VC users (Greenhalgh et al., 2016).

Another significant gap in current VC research is the scarcity of studies investigating the limitations and disadvantages of VC. Few studies address negative attitudes toward VC, governance issues, legal and technical challenges, and other obstacles (Greenhalgh et al., 2016). This lack of negative studies may lead to publication bias, potentially overstating the effectiveness and efficiency of VC (Greenhalgh et al., 2016; Jung & Padman, 2014; Ward et al., 2015).

VC is often perceived as a future replacement for face-to-face consultations (Van Velsen et al., 2017). However, many patients express a preference for face-to-face interactions, citing distrust in VC quality despite the additional time and cost associated with in-person visits (Gardner et al., 2015; Greenhalgh et al., 2016). These negative aspects are frequently mentioned in passing without in-depth exploration. Understanding these negative perceptions is crucial for the broader acceptance of VC technology (Greenhalgh et al., 2016).

This study addresses these gaps by focusing on patients' uncertainties through in-depth content analysis. By analyzing patients' text reviews of VC systems, the research aims to uncover the perceived uncertainties and their impact on patient satisfaction. This approach not only highlights the challenges faced by VC but also provides insights into improving patient-doctor communication in virtual settings.

In summary, while the positive outcomes of VC are well-documented, understanding the negative aspects

and patients' uncertainties is essential for the comprehensive acceptance and improvement of VC systems. This study contributes to the existing literature by providing a balanced view of VC, emphasizing the importance of addressing both positive and negative perspectives to enhance the overall effectiveness of telemedicine.

Patient Uncertainty

Uncertainty in communication refers to the subjective sense of the number of alternative predictions available regarding a partner's future behavior or the number of alternative explanations available for a partner's past behavior (Bradac, 2001). Managing uncertainty is a crucial process that significantly influences our interactions with others, particularly strangers (Duronto et al., 2005). In the healthcare context, uncertainty is pervasive in clinical practice (Danczak & Lea, 2017; Dauphin et al., 2020). Issues such as diagnosis, referral, treatment planning, and teamwork can all generate significant uncertainties for healthcare providers (Danczak & Lea, 2017).

In traditional face-to-face consultations, patients often experience uncertainty, anxiety, depression, and other psychological difficulties due to their limited understanding of medical issues and treatments (Ong et al., 1995). In the context of virtual consultations (VC), patients may experience uncertainties related to both the doctors and the VC systems (Panlaqui et al., 2017). However, the specific uncertainties in VC are not well defined. These uncertainties may arise from a perceived lack of information, similar to traditional consultations, or from the nature of the communication medium itself (Stefan Timmermans et al., 2018). These uncertainties can affect patients' cognitions, emotions, and decision-making processes (Schapira, 2014).

Effectively communicating uncertainty is essential in helping patients manage their concerns about the quality of the consultation and make informed decisions (Politi & Street, 2011). Good patient-doctor communication, whether face-to-face or computer-mediated (CMC), should instill confidence in patients that their doctor is an advocate who will support them, thereby reducing their uncertainty (Srivastava, 2011). Healthcare organizations must adapt to these uncertainties, continuously reprogramming and renewing themselves to meet future challenges (Cheng Lim & Tang, 2000). Understanding patients' uncertainties during their interactions with doctors can provide valuable insights for healthcare organizations to improve system design and enhance patient satisfaction.

Developing a Framework of Patient Uncertainty

Patient satisfaction is a critical metric influencing the adoption of healthcare systems and is a key focus for healthcare providers aiming to improve their services (Johnson et al., 2016). Research indicates that satisfied patients are more likely to adhere to prescribed treatments (Matthew P. Manary et al., 2013). While prior studies have extensively examined patient satisfaction in general healthcare contexts—including telemedicine, telemonitoring, and personal health records (Howard et al., 2007; Larsson & Wilde-Larsson, 2009)—there is limited research on patient attitudes towards virtual consultations (VC) specifically (Fatehi et al., 2015; Tejera Segura & Bustabad, 2016).

Patient perceptions and attitudes are crucial for assessing healthcare quality and are significant motivators for the adoption of healthcare systems (Johnson et al., 2016; Naidu, 2009). Patients' concerns, particularly uncertainties, greatly influence their perceptions and decisions regarding the use of VC systems. This study employs a content analysis framework to explore these uncertainties, as illustrated in Figure 1.

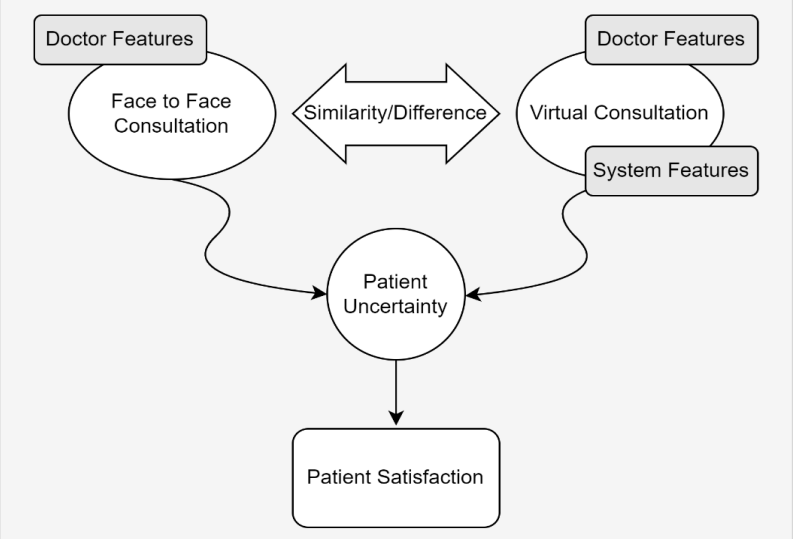

Figure 1. Patient uncertainty framework for content analysis

In face-to-face consultations, interactions are direct and natural, with communication quality largely dependent on human factors such as the doctor's professionalism, empathy, and the clarity of disease explanations. Patients can read body language, facial expressions, and other non-verbal cues, which contribute to the overall understanding and trust in the doctor's recommendations.

In the context of VC, the interaction is mediated through digital platforms, which can impact the richness and immediacy of communication. Technical issues such as poor video quality, lag, or audio problems can hinder the effectiveness of these consultations. Moreover, the inability to conduct physical examinations can limit the doctor's ability to make accurate diagnoses. Despite these challenges, a well-designed VC system can still facilitate high-quality interactions through features such as high-definition video, clear audio, and intuitive user interfaces that ensure smooth communication.

VC systems offer significant advantages in terms of efficiency and convenience. They allow patients to access healthcare services without the need to travel, which is particularly beneficial for those living in rural or underserved areas. This can lead to reduced waiting times, lower travel costs, and greater flexibility in scheduling appointments. However, these benefits come with challenges. Patients may feel uncertain about the quality of care they can receive remotely, especially if they are used to face-to-face consultations. There may also be concerns about the accuracy of diagnoses made without physical examinations and the potential for miscommunication due to technological limitations. Patients' uncertainties can stem from various sources, including unfamiliarity with the technology, concerns about the doctor's ability to provide effective care remotely, and fears about privacy and data security. Addressing these uncertainties is crucial for improving patient satisfaction and encouraging the adoption of VC systems.

This study aims to analyze patient reviews to identify the perceived uncertainties during VC interactions. By understanding these uncertainties, healthcare providers can better address patients' concerns, improve system design, and enhance the overall quality and acceptance of VC systems. This framework guides the exploration of how system-mediated communication impacts patient satisfaction and the adoption of VC in healthcare.

Data Collections

To gather insights into the user experience of virtual consultation systems, this study focused on collecting reviews from patients who utilized five prominent platforms: MDLive, Doctor on Demand, American Well, HealthTap, and Teladoc. These platforms were chosen due to their established user bases and the provision of video consultations facilitated by certified medical professionals accessible via both computer and mobile devices. Notably, the selected systems operate as private entities and are not universally accessible.

Collecting Patients' Reviews on Virtual Consultation Systems

Phase 1: Primary Data Collection

To collect reviews, E-commerce platforms and websites such as Amazon, Apple Store, iTunes, and Google Play were targeted. Key search terms, including the name of each system followed by "review," were utilized to refine the search.

The following steps were undertaken for each system:

1. Reviews from various websites, including Amazon.ca, Amazon.com, and official websites, were gathered.
2. Reviews available on mobile App Stores, specifically iTunes and Google Play, were accessed.
3. Supplementary searches using Google incorporated key search terms to ensure comprehensive coverage.

Websites and App Stores were prioritized for data collection due to their tendency to attract user feedback post-purchase or download. These platforms offer convenient avenues for users to share their experiences, thereby providing valuable insights into the functionality and user satisfaction of the virtual consultation systems. The inclusion of Google searches served as a supplementary measure to capture additional reviews.

Phase 2: Data Refinement

Following data collection, a refinement process was undertaken to ensure the quality and relevance of the collected reviews. The following criteria were applied:

1. Removal of irrelevant reviews that did not contribute to the assessment of patient experience.
2. Exclusion of reviews deemed meaningless, such as "Didn't use it".
3. Elimination of reviews authored by individuals other than patients, including healthcare professionals like doctors or nurses.

After applying the refinement criteria, a final dataset comprising 362 reviews was obtained, focusing exclusively on patient perspectives regarding their interactions with virtual consultation systems. This dataset serves as the foundation for the subsequent analysis and evaluation of user experiences with the selected platforms.

Classification by Research Framework

Upon identifying the reviews comprising the final dataset, the initial step for coders involved a thorough examination of each review to grasp its essence, thereby facilitating categorization based on the research framework delineated below. The framework delineates human-computer interaction traits, encapsulating characteristics of patients, doctors, and virtual consultation (VC) systems. Specifically, patients and doctors represent the human ends, while VC systems embody the computer ends, with interaction manifesting as communication between patients and doctors via VC systems. This study focused on exploring patients' uncertainties during their interaction with doctors, alongside their overall satisfaction, resulting in two primary categories: Uncertainty and Satisfaction. The coding categories and their respective numbers are detailed in Table 1.

Coding categories	Description	Number of Reviews (NR)
Doctor Features	Reviews about the professionalism of doctors and their attitudes	271
System Features	Reviews about features and characteristics of VC systems (such as videoconferencing, easy to use, etc.)	190
Patient Uncertainty	Reviews on patients' uncertainties on the VC experience during the patient-doctor communication	189
Patient Satisfaction	Reviews about patients' attitudes towards the consultation. Positive attitudes implied that they were satisfied, otherwise they were unsatisfied.	301
Other (insurance etc.)	Reviews about other issues, including network, insurance and so on.	43

Table 1. Coding Categories and Numbers for Each Category in Content Analysis

The analysis of reviews revealed the following insights:

Doctor Features:

This category, receiving the highest number of reviews (NR = 271), predominantly focuses on patients' assessments of doctors' professionalism and demeanor during consultations. The reviews underscore the pivotal role of doctors in shaping patients' perceptions and building trust, ultimately enhancing the efficacy of patient-doctor communication in virtual settings.

System Features:

Reviews in this category (NR = 190) center on the design elements and functionalities of VC systems, including the presentation of doctors' information, appointment scheduling processes, and consultation mechanisms. Notable features praised by patients include the ability to access other patients' reviews on doctors and simplified appointment procedures.

Patient Uncertainty:

Patients' uncertainties regarding the VC process, encompassing concerns about the qualification and professionalism of online doctors, communication quality, and consultation procedures, are encapsulated in this category (NR = 189). The digitalized nature of VC systems introduces novel challenges and opportunities, prompting patients to contemplate issues such as cost, privacy, and trust.

Patient Satisfaction:

The category of satisfaction (NR = 301) delves into patients' overall attitudes towards the consultation experience. Despite expressing reservations and uncertainties, many reviews convey positive sentiments towards VC, highlighting its perceived advantages and benefits.

Other (Insurance, etc.):

Miscellaneous topics such as customer service quality and insurance availability are encapsulated in this category (NR = 43), although it receives the least number of reviews.

This preliminary analysis underscores the significance of doctors and patients' uncertainties in the realm of patient-doctor communication within the VC context. Notably, while system features and other factors are depicted as independent in Table 1, they may be influenced by patients' experiences and external variables. For instance, negative experiences may magnify patients' scrutiny of system designs, thereby accentuating concerns and uncertainties. It is imperative to acknowledge these nuances in interpreting the findings, albeit their empirical

identification remains challenging.

Data Analysis

This study explores the concept of uncertainty in healthcare by examining patient reviews and drawing on existing literature on uncertainty. Initially, relevant literature was reviewed to identify dimensions for measuring uncertainty. In traditional face-to-face communication, these dimensions include issues related to understanding and prediction (Berger, 1986). These dimensions provide the basis for measuring uncertainty during patient-doctor computer-mediated communication (CMC).

Twenty out of 189 reviews categorized under uncertainty were selected for test-coding by two researchers. The test-coding process, combined with insights from relevant literature, helped generate the dimensions and elements of uncertainty. Following this, the researchers applied content analysis to the remaining 169 reviews in the uncertainty category, identifying specific uncertainty elements mentioned in the patient reviews. The coding reliability was confirmed with an average intercoder agreement of 89%, which was calculated as the average agreement percentage for each element. For instance, if 300 out of 327 reviews had consistent coding results for the element "doctor's attitudes," the agreement percentage would be 92% (300/327).

After examining the frequency of occurrence, three elements with very low frequencies were removed, resulting in six final elements of uncertainty. These elements are listed and described in Table 2.

Elements	Description	Number of Reviews
UC-VC Process	Patients are not sure about how to visit a doctor remotely. In other words, they don't know how to do VC.	121
UC-Doctor's Behavior	Patients have concerns about how the doctor will behave during online consultation, including whether the doctor is professional and qualified.	64
UC-Describing Symptoms	Patients have concerns about what symptoms would be important and should be told to the doctor during online consultation	17
UC-Doctor's Attitudes	Patients have concerns about whether the doctor is friendly and cares about them. This element focuses on how the doctor treats the patient while the element of DF focuses on how the doctor feels.	17
UC-Understanding Doctors	Patients have problems or concerns about clearly Understanding the doctor during the online consultation.	14
UC-Doctor's Feelings and Emotions	Patients are uncertain about how the doctor feels or his/her mood.	5

Table 2. Elements of Uncertainty (UC) Ranked by Frequency

Table 2 reveals significant sources of uncertainty in virtual consultations (VC). The most frequently mentioned element is the VC process, with 121 reviews highlighting patients' confusion about how to use telehealth platforms effectively. Issues such as app implementation problems, unclear waiting processes, and frequent technical glitches dominate this category. This high frequency indicates that procedural and technical challenges are the primary sources of uncertainty, suggesting a crucial area for improvement in making telehealth platforms more user-friendly.

Concerns about doctors' behavior during online consultations are the second most mentioned element, appearing in 64 reviews. Patients express doubts about the professionalism and qualifications of doctors, with skepticism about accurate diagnosis through virtual means. This highlights significant concerns about doctor competence and behavior, indicating the need to build patient trust in telehealth services. Additionally, 17 reviews each mention uncertainties related to describing symptoms and the doctor's attitudes. Patients struggle with effectively communicating their symptoms and are concerned about whether doctors are friendly and care about them. Ensuring positive and empathetic interactions can help alleviate these concerns.

Less frequently mentioned elements include understanding doctors (14 reviews) and the doctor's feelings and emotions (5 reviews). Patients report difficulties in comprehending doctors' explanations and perceive a lack of thoroughness within the consultation time. Although fewer in number, these issues reflect critical communication challenges that need addressing to improve patient understanding and satisfaction. While concerns about doctors' emotional states are the least mentioned, they still matter, as even a few negative interactions can impact overall patient satisfaction.

Overall, the findings suggest that enhancing the technical usability of VC systems and improving communication strategies are key to reducing patient uncertainties. Training doctors to maintain professionalism, empathy, and clear communication during virtual consultations can significantly enhance patient trust and

satisfaction. Addressing these areas will likely lead to better patient outcomes and a more effective telehealth experience.

In addition, the research framework suggested a link between patients' uncertainty levels and their satisfaction. Thus, the relationship between each element and patient satisfaction was also examined in this study. According to Cynthia Fraser (2009), if two categorical variables are associated, the probability of one will depend on the probability of the other. By analyzing the crosstabulation of frequencies/probabilities of two categorical variables, one can roughly determine whether there is an association between the two variables. When conditional probabilities differ from joint probabilities, there is evidence of association (Cynthia Fraser, 2009). The crosstabulation of uncertainty and patient satisfaction is presented in Table 3.

Count	**Satisfaction**		
Uncertainty Element	Satisfied	Unsatisfied	Total
1. Doctor's Behavior	15	46	61
2. Describing Symptoms	10	6	16
3. Understanding Doctors	1	12	13
4. Doctor's Feelings/Emotions	1	3	4
5. Doctor's Attitudes	2	13	15
6. Virtual Consultation Process	43	74	117
Total	72	154	226
% of Row	**Satisfaction**		
Uncertainty Element	Satisfied	Unsatisfied	Total
1. Doctor's Behavior	25%	75%	100%
2. Describing Symptoms	63%	38%	100%
3. Understanding Doctors	8%	92%	100%
4. Doctor's Feelings/Emotions	25%	75%	100%
5. Doctor's Attitudes	13%	87%	100%
6. Virtual Consultation Process	37%	63%	100%
Total	32%	68%	100%

Table 3. Crosstabulation: Patient Satisfaction Depends on Uncertainty

To gauge the association between uncertainty and patient satisfaction, the conditional probability of each uncertainty element, given each condition of satisfaction, was compared to the unconditional, row probabilities of uncertainty. If these probabilities differ, it indicates an association. Table 3 shows that 32 percent of patients who are uncertain about the overall virtual consultation (VC) experience are satisfied, while 68 percent are unsatisfied. Specifically, 63 percent of patients uncertain about describing symptoms are satisfied, and 92 percent of those uncertain about understanding doctors are unsatisfied. If uncertainty and patient satisfaction were not associated, we would expect 32 percent of patients uncertain about describing symptoms to be satisfied. Instead, 63 percent are satisfied, showing a significant deviation from the expected probability.

These variations highlight a greater chance of satisfaction (63%) when uncertainty pertains to describing symptoms, compared to other uncertainty elements. Conversely, patients who are uncertain about understanding doctors have a much lower probability of satisfaction (8%). Ignoring uncertainty, the overall probability of satisfaction is 32 percent. However, when acknowledging uncertainty, satisfaction probabilities range from 8 percent (understanding doctors) to 63 percent (describing symptoms). These differences in row percentages suggest a clear association between uncertainty and patient satisfaction.

Numerous studies have reported a positive association between patient satisfaction and various characteristics of doctors and healthcare outcomes. Effective communication skills, professionalism, and high-quality healthcare can greatly enhance patient satisfaction (Farley et al., 2014; Linder-Pelz & Struening, 1985; Meesala et al., 2017). The results from this study further suggest an association between uncertainty and patient satisfaction. This association should be thoroughly studied, as addressing patient uncertainty can be crucial in improving their satisfaction, even when other conditions are optimized.

In conclusion, understanding and mitigating patient uncertainty in virtual consultations is essential. Enhancing telehealth platforms' user experience, ensuring clear and effective communication, and building trust in the competence and empathy of online doctors are critical steps to improving patient satisfaction and overall healthcare outcomes. Addressing these areas could lead to a more effective and satisfactory telehealth experience for patients.

In addition to examining patients' uncertainties, we also coded all the benefits mentioned in their reviews to gain a comprehensive understanding of the advantages of virtual consultations (VC). Compared to face-to-face consultations, VC offers significant convenience to patients. However, there are areas needing improvement, such as insurance coverage, customer service, and follow-up services. The main benefits are presented in Table 4.

Benefits	Descriptions	Number of Reviews
Convenience	It's convenient for patients to visit doctors online, e.g., saving the trouble of driving to hospital, saving time in the waiting room etc.	298
Easy Prescription	Prescription is digitally sent to nearest pharmacy by doctor and it's easy to get treatment drugs for patients.	207
Access to care	Rural patients can access to a doctor at special times, including weekends, holidays, at night, in emergency conditions.	184
System usefulness	The website/APP is useful for patients to see doctors, and it's helpful with guiding people through consultation processes.	95
Customer service	Customer service is friendly. Patients will be followed up after their consultation.	86
Saving money	Patients view online consultation as a more affordable way to visit doctors compared to visiting doctors in person.	76
Others	Other benefits mentioned by patients include insurance availability, medical record benefit and others.	132

Table 4. Benefits of Virtual Consultation

Conclusions

Healthcare providers face the challenge of determining where to allocate resources to enhance service quality, ultimately aiming to boost patient satisfaction and foster interest in utilizing virtual consultation (VC) systems. This study employed content analysis to identify six key elements of patient uncertainty and to investigate the relationship between uncertainty and patient satisfaction. Notably, the study identified the most significant uncertainty elements for patients, with VC process and Doctors' Behavior being the primary concerns, followed by Describing Symptoms and Doctors' Attitudes.

Understanding patients' uncertainties is crucial for improving current VC systems. Many patients express apprehensions about doctors' behavior and attitudes during communication, underscoring the importance of assuring patients regarding the professionalism and informativeness of doctors in providing accurate diagnoses. One approach could involve providing more comprehensive information about doctors online to demonstrate their qualifications, along with incorporating patient reviews to offer potential patients a more complete understanding of the doctor's capabilities. Addressing these uncertainty elements can guide healthcare providers in creating a patient-centered environment conducive to effective patient-doctor communication and satisfaction with VC.

Furthermore, the study underscores the advantages of VC over traditional face-to-face consultations, particularly in terms of convenience and access to prescriptions. Despite not being inherent design features of VC systems, these benefits are closely linked to system features and can inform system design improvements. Thus, it is recommended that VC system developers focus on enhancing convenience and prescription access. For instance, reducing consultation time by streamlining registration processes and ensuring platform availability across various formats, including computers, mobile phones, and wearable devices, can significantly enhance patient experience and accessibility to VC services. By addressing these aspects, VC systems can better meet patient needs and preferences, ultimately improving patient satisfaction and promoting broader adoption of VC technology in healthcare delivery.

One limitation of this study stems from the inherent bias in the nature of reviews, which tend to be submitted when individuals are either highly satisfied or dissatisfied with their experience. The absence of neutral reviews may skew the findings and potentially overemphasize extreme viewpoints, thus affecting the overall conclusions drawn from the study.

Furthermore, the generalizability of the results is constrained by the focus on only five popular private VC systems, primarily used by patients in the United States. Users of less popular systems or those from different regions may have different perceptions and concerns regarding VC, which could influence the applicability of the findings beyond the studied context. Future research endeavors could expand the scope to include a broader range of VC systems and diverse patient populations to enhance the representativeness of the findings.

Another avenue for future investigation involves exploring additional elements beyond the six categories identified in this study. While certain elements were excluded due to low mention frequency in the dataset, such as privacy and security concerns, these factors could still impact patient attitudes toward VC and warrant further examination. Additionally, the existing six elements could be subdivided into more specific indicators to provide a more nuanced understanding of patient uncertainty and satisfaction in the context of VC.

Lastly, future research efforts could focus on identifying and evaluating specific design features aimed at mitigating patient uncertainty in VC settings. By systematically analyzing the effectiveness of various design

interventions, healthcare providers and system developers can gain insights into practical strategies for enhancing patient confidence and satisfaction during virtual consultations. This forward-looking approach holds promise for advancing the usability and effectiveness of VC systems in improving healthcare delivery.

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