Evaluation of Online Andrology Medical Services in Central Regions of China During the COVID-19 Pandemic: A Cross-Sectional Data Analysis Study

Zhi Liu, PhD¹, Chunyu Zhang, MMed², Cong Luo, MD², Junlin Ou, EngD², Ming Song, Bachelor’s Degree³, Lingxiao Yang, MBA⁴, Xin Wang, MMed³, Jinbo Chen, MD², Guilin Wang, MD², Tao Guo, PhD²,³

Abstract
To provide an overview of the current situation, challenges, and trends in online medical services from the perspective of andrology and promote the development of online medical services. Users of the Learning Alliance of Urology, who mainly worked in central regions of China, were invited to complete the questionnaire that included information on the participants and their institutions and their involvement in and concerns for online medical services. We received 875 complete responses. The percentage of online andrology patients at most institutions was less than 30%. The most common services were online appointment registration (92.7%) and online payment (81.8%). Online chat consultation (77.7%) was the most common form of consultation. Only 1 in 5 of the institutions had constructed their Internet hospital. Factors related to the percentage of online andrology patients included specialized andrology clinics and wards, sufficient time for doctors to provide online services, more diversified services, and online clinic training. The biggest challenge for online medical services was diagnosis and treatment safety. It is essential to raise awareness of online medical services for hospitals and patients and strengthen standardized management and training of online medical services, especially applicable to central regions of China. However, online medical services cannot wholly replace offline services due to insufficient diagnosis and treatment.

Keywords
online medical services, andrology, COVID-19, China

What do we already know about this topic?
Online medical services have attracted more users due to technological developments and the COVID-19 pandemic.

How does your research contribute to the field?
Factors related to the percentage of online andrology patients included specialized andrology clinics and wards, sufficient time for doctors to provide online services, more diversified services, and online clinic training. The biggest challenge for online medical services was diagnosis and treatment safety.

What are your research’s implications toward theory, practice, or policy?
Advocacy and management are essential to promoting online medical services, which should be the focus of relevant policies in the future.

Introduction
Over the past 5 years, China has been committed to promoting the use of the Internet to provide medical services, although it is still in the exploratory stage.¹ As an innovative medical model where professional physicians provide health care services on the Internet, the online medical services include, but not limited to, health-related consultations, remote disease diagnoses, medication prescription, and chronic disease management. The Internet supplements offline medical services and dramatically alleviates the relative shortage of medical resources in China.²

Since the first report of the novel coronavirus pneumonia (COVID-19) in January 2020, the disease has spread worldwide without indication of rapid cessation.³,⁴ This epidemic has constituted a public health emergency of pandemic proportions⁵ and posed dilemmas in many areas of health care, such as lack of hospital resources, suspension of outpatient
services, inconvenience in seeking medical treatment, and nosocomial infection. Fortunately, Internet medical services can satisfactorily resolve these dilemmas by surmounting geographic and time-related barriers. Compared with traditional offline medical services, the online one makes it easy for patients to seek doctor services rapidly. Additionally, these services reduce the chance of potential nosocomial cross-infection by keeping patients away from hospitals. With the outbreak of COVID-19 and government support, online healthcare will undoubtedly usher in unprecedented opportunities for its unique advantages.

Urological issues are frequently associated with shame or embarrassment for the affected individual, especially in the field of andrology. It is natural and understandable for affected people to look for information via various channels (primarily the Internet) before consulting a specialized physician. But it may lead to misdiagnosis because of the difficulty in judging the credibility of Internet information. Although current online medical services provided by professional doctors offer reliable options for patients due to the rapid development of technology and active government support, it has not been systematically and exhaustively assessed yet. In this study, we aimed to provide an overview of the current situation, challenges, and trends in online medical services from the perspective of andrology to optimize online medical services.

Materials and Methods

Participant Recruitment and Data Collection

We conducted an online survey from February 2021 to August 2021. The study subjects included medical staff registered in the Learning Alliance of Urology (https://www.ysxxlm.com/#/), an integrated “Internet + medical” service organization established by Hunan Youan Medical Technology Co., Ltd. The procedures related to human subjects were approved by the Ethics Committee of Xiangya Hospital, Central South University. And we have obtained written informed consent from all the participants before they completed the questionnaire. As the most significant new media platform for urology and andrology in China, the alliance mainly recruits urologists from secondary or above public hospitals (mostly competent physicians or related chief physicians), who represent the current backbone of urology in China. The members are spread throughout the country, mainly in Shandong, Hunan, and Hebei provinces. Therefore, the study population is representative for evaluating urology online medical services in central regions of China. This study report conforms to STROBE [Strengthening the reporting of observational studies in epidemiology] guidelines.

Survey Instrument

The survey instrument was a validated semi-structured questionnaire in which all information was self-reported. The questionnaire consisted of basic information (province and professional title), 20 multiple-choice questions, and 1 open question for individuals. The questions covered the information of the participants as well as their institutions, involvement in online medical services, and concerns about online medical services. The purpose of the research was stated on the first page of the questionnaire, informing the participants about the study objective and promising the confidentiality of their information. All participants consented to participate in the survey before filling out the questionnaire. A total of 875 valid questionnaires were finally received.

Statistical Analysis

We used Microsoft Excel, version 2017, for data management and chart drawing. Geographical distribution was plotted with the online tool Hiplot (https://hiplot.com.cn/). Categorical variables were reported as frequency counts and percentages (%), which were presented on bar and pie charts. All statistical analyses were performed with SPSS software, version 19.0 (SPSS, Chicago, IL, USA). Categorical variables were compared using the Chi-square test. All the reported P values were 2-sided, and a P value of <.05 was considered statistically significant.

Results

General Information of Participants and Their Institutions

In total, 875 participants completed the survey from February 2021 to August 2021. The questionnaire results are...
summarized in Supplemental Table 1. Most participants came from Hunan (98 [11.2%]), Shandong (78 [8.9%]), and Henan (75 [8.6%]) provinces. As for the identity of the participants, almost all were doctors (863 [98.6%]). The geographic and identity distributions were broadly consistent with the platform registered members, as shown in Figure 1.

Approximately 89% of the participants worked in public hospitals, and half of the participants said their institutions had 16 to 45 beds for urology. For andrology, only 41% of institutions had a specialized andrology outpatient clinic, and 26% had a specialized andrology ward. These data can represent the current situation of andrology in Chinese public hospitals.

**The Involvement of Participants and Their Institutions in Online Medical Services**

The andrology online sources accounted for no more than 30% of total andrology sources at most institutions (95%; Figure 2A). One of the essential reasons is patients’ lack of awareness about online medical services. In approximately 75% of institutions, ≤10% of patients had online counseling prior to their visit. Meanwhile, ≤10% of patients in 60% of institutions continued online counseling after visit. Another reason is that the qualifications of online medical services are not perfect. While most institutions (64%) realized that Internet services could contribute to better hospital development, only 18% had an Internet hospital license, 20% planned to obtain one, and 56% didn’t even plan. Additionally, 3-quarters of institutions have yet to train on online health services formally.

The most common types of the provided online medical services were online appointment registration (93%) and online payment (82%) (Figure 2B). Other forms of online medical services were also attempted at some institutions, including inter-clinic payment (39%), online inquiry (45%), drug distribution (17%), online follow-up (29%), online chronic disease management (21%), teleconsultation (43%), patient community service (19%), and online report query (46%). Online chat consultation (78%), as well as telephone consultation (69%), were the most common forms of online consultation, while a small percentage also attempted...
Analysis of Factors Associated With the Percentage of Andrology Online Patients

We explored the factors that may be associated with the percentage of online andrology patients to provide more references for the construction of online medical services. As shown in Table 1, the institutions with a high percentage of online patients generally were featured by these: specialized andrology clinics and wards ($P = .0154$ and $.0470$, respectively), sufficient time ($>30$ min/day) for doctors to provide online medical services ($P = .0010$), more diverse online medical services ($P = .0486$), and training ($P < .0001$). However, the institution’s nature, the department’s size, online consultation form, and the approval of Internet hospitals were not significantly related to the percentage of online patients.

Concerns About Online Medical Services

Most physicians expected to build a personal brand (70%), accumulate clinical cases (62%), increase revenue (57%), communicate with peers (46%), and attract suitable patients (50%) by participating in online medical services. Besides, 165 (19%) participants indicated that their involvement in online medical services was motivated by curiosity.

Overall, about half of the participants were satisfied with current online medical services. Only 8% of institutions were in favor of online medical services, 44% were not in favor of it, while the remaining 48% had an unclear attitude. The most common concern about online medical services was the safety of diagnosis and treatment (83%), reflecting the limitation of online medical services. Thus, 74% of the participants believed that online medical services, while effective, were of limited use. In response to the differences between third-party and hospital service platforms, most participants (57%) argued that third-party platforms have more established doctor management systems and training in online medical services.

Discussion

The COVID-19 pandemic has significantly disrupted normal medical activities worldwide. To help prevent its spread, online medical service platforms have been rapidly adopted by governments.10,11 It is well established that men are reluctant to visit healthcare practitioners.12 In addition, male health issues such as erectile dysfunction (ED) and male infertility are highly stigmatized, further reducing the men’s likelihood of visiting a specialist offline.13,14 The abundance of online medical services provides a reliable option for andrological issues for the affected males. Considering the current situation and the characteristics of andrology, the Internet medical services for andrology are promising. Therefore, we performed this study to evaluate the current status, challenges, and trends of andrological Internet medical services to promote the development of andrological Internet medical services.

A total of 875 medical workers from central regions of China completed the questionnaire. Most of them are andrology doctors with experience providing online medical services. Therefore, we believe that our study can provide a good landscape of the current state of andrological online medical services.

Furthermore, we revealed some factors that may attract patients to online medical services. The first was specialized andrology clinics and wards. This may suggest that the institution attaches importance to andrology and has accumulated more experience in andrology, which are the main highlights of attracting patients to seek online services about andrology. Second, diversified medical services were also related to more online patients. The final factor affecting the
Online medical services include many elements, such as appointment registration and online payment. This result was consistent with data from an interview study of 7934 respondents, which showed that 37% of Internet users use the Internet to prepare for doctor appointments. Overall, we believe online medical services can reduce barriers to self-diagnosis and self-treatment for men and may even help them overcome their reluctance to visit healthcare providers. It is of great significance to promote andrological online medical services to fill the shortage of andrology in public hospitals and enable patients to receive proper guidance and treatment.

There are many practical advantages to providing online medical services. First, a standardized and well-established Internet hospital can help institutions establish their brand and accumulate patient sources. However, many institutions are unaware of this necessity, suggesting the need to increase policymakers’ awareness that the construction of Internet hospitals is conducive to hospital development. In addition, the third-party platform has specialized physician management and training, which was not performed in three-quarters of the institutions. More than half of the participants believe this is the most significant difference between third-party and hospital platforms. Second, online medical services theoretically make medical services more accessible to potential patients, regardless of geographical factors. Furthermore, online consultation about andrology can avoid patients’ embarrassment of face-to-face inquiry. Despite these conveniences, less than 10% of patients at most institutions have taken online counseling prior to visiting their doctor. A survey of 6369 Americans revealed inconsistencies in ideas and behaviors about health problems, that is, most preferred to go to a doctor first but went online first. This discrepancy may be explained by the relatively late development of online medical services in China and the poor understanding of patients. Therefore, it is recommended that the government strongly support the construction of online hospitals while improving residents’ acceptance of online medical services. Finally, for doctors, delivering medical services through Internet hospitals can increase their income and expand and deepen their clinical experience with patients. Our survey found that the original intention of most doctors in participating in online medical services was to establish their brands, accumulate clinical cases, and obtain additional income.

Despite the advantages, we cannot ignore the issues of online medical services. Online diagnosis and treatment safety has always been the most concerning problem and even led to doctor-patient disputes. Due to the lack of face-to-face communication and physical examination, it is difficult for doctors to understand the patient’s situation, so underdiagnosis and misdiagnosis may occur. That’s why three-quarters of doctors believe that the role of online medical services is limited. Therefore, the form and content of online medical services still need to be improved to avoid diagnosis and treatment accidents.

This study yielded some valuable results; however, there are still limitations that must be addressed in future studies. First, the data were from a single platform, and the participants were mainly concentrated in Hunan Province, China. Thus, our conclusions may not fully reflect the differences in the status of online medical services among different regions. Future studies will consider collecting data from several other platforms to comprehensively discuss the prospects of online medical services in China. Second, no power calculation was done to estimate sample size, and the questionnaires/scales were not pilot-tested, which would be improved in the follow-up investigation. Finally, we focused on online medical services for andrology, but patients with different

Table 1. Analysis of Factors Affecting the Percentage of Online Andrology Patients.

|                         | Percentage of online andrology patients |
|-------------------------|-----------------------------------------|
|                         | ≥30% (n = 828)                           | >30% (n = 47)                           | P value |
| Nature of institutions (public hospital) | 740                                      | 42                                      | .9992   |
| Beds for urology (>30)   | 526                                      | 32                                      | .5271   |
| Specialized andrology clinic | 328                                      | 27                                      | .0154   |
| Specialized andrology ward | 209                                      | 18                                      | .0470   |
| Time for online services (>30 min/day) | 394                                      | 34                                      | .0010   |
| Types of online medical services (≥3) | 638                                      | 42                                      | .0486   |
| Online chat consultation  | 640                                      | 31                                      | .0539   |
| Approval of Internet hospital | 136                                      | 11                                      | .2132   |
| Online clinic training    | 194                                      | 26                                      | <.0001  |

The bold entries in Table 1 indicates statistically significant (P value < 0.05)
diseases have different degrees of involvement in online services. Although this department’s representativeness was considered in this study’s selection, further studies should consider other departments as various diseases may have additional service requirements. For example, oncology patients may need online services such as drug distribution and remote consultations. Some chronic conditions may achieve better standardized management through online medical approaches. Thus, more comprehensive guidance can be provided by constructing more online medical services.

Conclusion
Our study shows the current situation, trends, and challenges of online medical services in central regions of China from the perspective of andrology. The services provide necessary medical support for the public under the background of the COVID-19 outbreak and have strong development potential. However, these conclusions should be established on improving standardized management, training, diagnosis, and treatment.

Acknowledgments
We sincerely thank Belaydi Othmane for editing the language of this article.

Contributorship statement
(I) Conception and design: TG, GLW, and ZL. (II) Administrative support: GLW and ZL. (III) Provision of study materials or patients: TG, GLW, and ZL. (IV) Collection and assembly of data: CL, JLO, MS, LXY, XW, and JBC. (V) Data analysis and interpretation: CL, JLO, MS, LXY, XW, and JBC. (VI) Manuscript writing: All authors.

Declaration of Conflicting Interest
The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Tao Guo, Ming Song, and Xin Wang are employed by Learning Alliance of Urology.

Funding
The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Science and Technology fund project of Health and Family Planning Commission of Guizhou province (No. gzwkj2022-100, No.gzwkj2023-116).

Informed Consent
We have obtained informed consent to participate in the study from all participants.

ORCID iD
Guilin Wang https://orcid.org/0000-0003-2216-0729

Supplemental Material
Supplemental material for this article is available online.

References
1. Xie X, Zhou W, Lin L, et al. Internet hospitals in China: cross-sectional survey. J Med Internet Res. 2017;19(7):e239. doi:10.2196/jmir.7854
2. Tu J, Wang C, Wu S. The internet hospital: an emerging innovation in China. Lancet Glob Health. 2015;3(8):e445-e446. doi:10.1016/S2214-109X(15)00042-X
3. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet. 2020;395(10229):1045-1062. doi:10.1016/S0140-6736(20)30566-3
4. Xu XW, Wu XX, Jiang XG, et al. Clinical findings in a group of patients infected with the 2019 novel coronavirus (SARS-Cov-2) outside of Wuhan, China: retrospective case series. BMJ. 2020;368:m606. doi:10.1136/bmj.m606
5. Cucinotta D, Vanelli M, WHO declares COVID-19 a pandemic. Acta Biomed. 2020;91(1):157-160. doi:10.23750/abm.v91i1.9397
6. Lai CC, Shih TP, Ko WC, Tang HH, HsuEH PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): the epidemic and the challenges. Int J Antimicrob Agents. 2020;55(3):105924. doi:10.1016/j.ijantimicag.2020.105924
7. Isautier JM, Copp T, Ayre J, et al. People’s experiences and satisfaction with telehealth during the COVID-19 pandemic in Australia: cross-sectional survey study. J Med Internet Res. 2020;22(12):e24531. doi:10.2196/24531
8. Hunt N, McHale S. Psychosocial aspects of andrologic disease. Endocrinol Metab Clin North Am. 2007;36(2):521-531. doi:10.1016/j.ecl.2007.03.001
9. von Elm E, Altman DG, Egger M, et al. Guidelines for reporting observational studies. BMJ. 2007;335(7621):748-750. doi:10.1136/bmj.38379.68497.w
10. Thomas EE, Haydon HM, Mehrotra A, et al. Building on the momentum: sustaining telehealth beyond COVID-19. J Telemed Telecare. 2022;28:301-308. doi:10.1177/1357933x20960638
11. Snoswell CL, Caffery LJ, Haydon HM, Thomas EE, Smith AC. Telehealth uptake in general practice as a result of the coronavirus (COVID-19) pandemic. Aust Health Rev. 2020;44(5):737-740. doi:10.1071/AH20183
12. Pinkhasov RM, Wong J, Kashanian J, et al. Are men shortchanged on health? Perspective on health care utilization and health risk behavior in men and women in the United States. Int J Clin Pract. 2010;64(4):475-487. doi:10.1111/j.1742-1241.2009.02290.x
13. Arya ST, Dibb B. The experience of infertility treatment: the male perspective. Hum Fertil (Camb). 2016;19(4):242-248. doi:10.1111/hfc.122083
14. Pontin D, Porter T, McDonagh R. Investigating the effect of erectile dysfunction on the lives of men: a qualitative research study. J Clin Nurs. 2002;11(26):242-248. doi:10.1046/j.1365-2702.2002.00605.x
15. Andreassen HK, Bujnowska-Fedak MM, Chronaki CE, et al. European citizens’ use of E-health services: a study of seven countries. BMC Public Health. 2007;7:53. doi:10.1186/1471-2458-7-53
16. Hesse BW, Nelson DE, Kreps GL, et al. Trust and sources of health information: the impact of the Internet and its implications for health care providers: findings from the first Health Information National Trends Survey. Arch Intern Med. 2005;165(22):2618-2624. doi:10.1001/archinte.165.22.2618