Impact of Covid-19 on urogenital online learning through WeChat in China

Peng Zhang

Zhongnan Hospital of Wuhan University

Yongbao Wei

Fujian Provincial Hospital

Xin Li

the Chinese People's Liberation Army 118 Hospital

Dewen Zhong

Longyan First Affiliated Hospital of Fujian Medical University

Wei Song

Hunan Provincial People's Hospital, the First Affiliated Hospital of Hunan Normal University

Yanlin Wen

the Second Clinical Hospital of North Sichuan Medical College

Longfei Liu (✉ longfei_liu@csu.edu.cn)

Central South University

Research Article

Keywords: Social media, Continuing medical education, Urogenital, WeChat, Covid-19

Posted Date: April 21st, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-424251/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Abstract

Background

To evaluate the significance of social media and the impacts of Covid-19 on urogenital continuing education in China through WeChat.

Methods

Backend database from a Chinese urological online learning platform on account of WeChat named *Jiujing* before and during Covid-19 pandemic were compared and analyzed. An online questionnaire investigation containing 482 respondents was carried out to evaluate the impact of Covid-19 on urological online learning through WeChat.

Results

During the epidemic of Covid-19, the amounts of national subscribers in *Jiujing* platform increased by 26.24%, while the constituent ratio of subscribers' quantity from Hubei province decreased although there were 189 new subscribers, and only surgery video section experienced increased constituent ratio of subscribers' concerns. Online investigation indicated that most respondents experienced whittled offline learning opportunities and boosted online learning demands during Covid-19 pandemic as online learning was more efficiency, and these attitudes were associated with qualifications of the respondents. Surgery videos and academic lectures were the most popular sections. Preferences of the respondents were determined by gender, title, degree and affiliation hierarchy.

Conclusions

Even though the Covid-19 pandemic has affected the patterns of online medical education to a certain degree, continuing learning through social media like WeChat is essential and beneficial for urologists. Positional title, affiliation hierarchy and education background are supposed to impact their attitudes towards online learning.

Background

The last decade witnessed rapid development of Internet, which has remarkably changed people's lifestyle. In China, WeChat is a popular social application based on either computers or cellphones, which contains multiple functions like text and voice messages, group chats, subscribe to public accounts, and applets [1]. The economic transition in China led to the increasingly structural imbalance of talents, while the number and structure of professional technical talents cannot meet market demands [2]. Meanwhile, the gap between urban and rural areas or among regions in China has caused the shortage and unbalanced distribution of high-quality medical resources, especially the disequilibrium in technological capacities of medical practitioners [3].

The applications of social media in healthcare and its role in scientific communication provide great opportunities in the urogenital community [4]. Consequently, urologists and andrologists around the world have been using social media for business affairs, academic conferences and health providing [5]. Meanwhile, the development of the new media greatly challenges traditional education mode, which helps break departed imbalance between doctors and patients, or doctors from different areas. Especially, the outbreak of Covid-19 has restricted face-to-face learning and significantly promoted transformation of medical continuing education patterns [6].

A group of urologists and andrologists from different cities and affiliations in China founded an academic platform on account of WeChat named *Jiujing*, which is the pronunciation in Chinese Pinyin and means exploring the art of urogenital endoscope. It provides an open accessible and generally shared academic platform, aiming at promoting skills, innovating perceptions and serving the professionals and residents. Since established on December 15th in the year of 2015, nearly 700 messages have been released in *Jiujing* through WeChat. Over 50 public lectures have been broadcasted online and nearly 8,000 participants have joined 18 chat groups. The platform provides the users with latest literatures express, medical humanity sharing, free online lectures or surgical videos, difficult or special cases discussions and interactions in academic opinions. Urologists, andrologists and related practitioners are encouraged to share their clinical experience, surgical videos or research reports through the platform. Editors from the platform also invite related specialists to give commonweal online lectures and more than 13 thousand listeners have followed the courses. In this way, advanced concepts and ideas are disseminated ignoring barriers of regions and qualifications among the urologists and andrologists.

The pandemic of Covid-19 triggered transitions of online medical learning, in line with this, some structural alterations of the subscribers in *Jiujing* platform have been noticed. Consequently, we carried out an online questionnaire investigation to explore the impact of Covid-19 on urogenital online learning through WeChat platform.

Methods

Data acquisition and descriptive analysis from WeChat platform

Data of the subscribers in *Jiujing* platform were obtained from the backend database of WeChat Media Platform (<https://mp.weixin.qq.com/>). General information of the subscribers including gender, age, region and language were collected. Distributions of the subscribers' regions and clicks volumes of each

section in the platform before (data by the end of 2019) or during (data by the end of 2020) the epidemic of Covid-19 were compared.

Online survey on urogenital learning through WeChat during Covid-19 pandemic

The online survey titled “The effect of WeChat platform on urogenital learning during the Covid-19 pandemic” was carried out through the online questionnaire instrument WENJUANXIN (<https://www.wjx.cn/>), which is a platform for professional online surveying, evaluation, and voting in China [7]. The electronic questionnaires containing 11 choice questions (10 single choices and 1 multiple choice) were sent to the followers of *JiuJing*, and the investigation was performed from February 27 to March 9, 2021. General information questions included gender (item 1), title (item 2), degree (item 3), hierarchy of affiliation (item 4), whether from teaching hospital (item 5), whether frontline staff against Covid-19 (item 6). The attitudinal questions included influence of Covid-19 on face-to-face learning opportunities (item 7) and online learning demands (item 8), efficiency comparison between face-to-face and online learning (item 9), whether benefiting from online learning (item 10), the most beneficial sections (item 11, multiple choice).

Statistical analysis

Data were presented as numbers with percentages (n, %). Descriptive analysis of the data from WeChat Media Platform was performed with Microsoft Excel (2019 edition). Logistic regression analysis and chi-square test of the investigation data were analyzed using the online software SPSSAU (version 20.0, retrieved from <https://www.spssau.com>) [8]. The **p*-value < 0.05 or ***p*-value < 0.01 were considered statistically significant.

Results

Impacts of Covid-19 pandemic on distributions and preferences of the subscribers in JiuJing platform

According to the backend database from WeChat, by the end of 2020, about 22000 individuals have followed the account with total quantity of views approaching 2.4 million. The distribution of languages used by the subscribers were Chinese (98.81%), English (1.01%) and other (0.18%). Approximately 84.88% of the subscribers were male, and 74.68% of them were 26 to 45 years old.

The amounts of subscribers increased by 26.24% during the epidemic of Covid-19. As in Fig. 1A, before the Covid-19 pandemic, the top five distribution provinces of the users were Guangdong (9.68%), Hunan (7.02%), Shandong (6.40%), Hubei (6.11%) and Henan (5.99%). As in Fig. 1B, during the Covid-19 pandemic, the top distribution provinces of the users were Guangdong (10.29%), Hunan (8.39%), Shandong (6.31%), Jiangsu (5.82%), Henan (5.52%), Sichuan (5.43%) and Hubei (5.38%) (Fig. 2). Although there were 189 new subscribers from Hubei, the worst attacked province by the coronavirus in China during the epidemic of Covid-19, it has witnessed a decreased constituent ratio of subscribers' quantity. Simultaneously, only the surgery video section experienced increased constituent ratio of subscribers' concerns (according to the data of browsing frequency), while constituent ratios of academic lectures, case reports, medical humanity, online interaction and literature express sections decreased (Fig. 1C).

Impacts of Covid-19 pandemic on urogenital face-to-face and online learning through WeChat platform

A total of 482 valid questionnaires were received and the general information of the respondents is presented in Table 1. Most of the respondents experienced whittled face-to-face learning opportunities (364/482, 75.52%) and increased online learning demands (413/482, 85.68%) during Covid-19 pandemic. Compared with face-to-face learning (168/482, 34.85%), more respondents considered online learning (215/482, 44.61%) as the more effective manner. Overwhelming majority (466/482, 96.68%) acknowledged that they have benefited from online learning though WeChat platform during Covid-19 pandemic. Among the personal characteristics, differences of the respondents' positional titles remarkably impacted their choices (Table 2). With the ascending of qualification, significantly more respondents suffered decreased face-to-face learning opportunities (64.29% of primary physicians, 74.05% of attending physicians, 80.37% of assistant director physicians, 79.69% of director physicians), and regarded face-to-face learning as the more effective learning manner (25.71% of primary physicians, 30.81% of attending physicians, 39.88% of assistant director physicians, 43.75% of director physicians).

Table 1
General information of the respondents (n, %)

Items		Values
Gender	Male	461 (95.64)
	Female	21(4.36)
Title	Director physician	64 (13.28)
	Assistant director physician	163 (33.82)
	Attending Physician	185 (38.38)
	Primary physician	70 (14.52)
Degree	Doctor	61 (12.66)
	Master	142 (29.46)
	Bachelor	257 (53.32)
	Associate	22 (4.56)
Affiliation Hierarchy	National or ministerial level	29 (6.02)
	Provincial or municipality level	89 (18.46)
	City level	163 (33.82)
	Level of county and below	201 (41.70)
Teaching hospital staff	Yes	306 (63.49)
	No	176 (36.51)
Frontline staff against COVID-19 ^a	Yes	144 (29.88)
	No	338 (70.12)
^a Official definition of China: those who have directly participated in the diagnosis, treatment, examination, transport, nursing, epidemiological survey and specimen collection of the confirmed or suspected cases with Covid-19.		

Table 2
Attitudes towards Covid-19 pandemic on urogenital online learning through Wechat platform (n, %)

Items		Face-to-face learning opportunity			Online learning demand			More effective manner		
		Increased	Decreased	Unchanged	Increased	Decreased	Unchanged	Online	Face-to-face	Indiscriminate
Gender	Male	80(17.35)	350(75.92)	31(6.72)	395(85.68)	15(3.25)	51(11.06)	202(43.82)	162(35.14)	97(21.04)
	Female	4(19.05)	14 (66.67)	3(14.29)	18(85.71)	0(0.00)	3(14.29)	13(61.90)	6(28.57)	2(9.52)
	χ^2	1.889			0.87			3.019		
	p	0.389			0.647			0.221		
Title	Director physician	11(17.19)	51(79.69)	2(3.13)	50(78.13)	3(4.69)	11(17.19)	19(29.69)	28(43.75)	17(26.56)
	Assistant director physician	19(11.66)	131(80.37)	13(7.98)	140(85.89)	5(3.07)	18(11.04)	71(43.56)	65(39.88)	27(16.56)
	Attending Physician	39(21.08)	137(74.05)	9(4.86)	163(88.11)	6(3.24)	16(8.65)	91(49.19)	57(30.81)	37(20.00)
	Primary physician	15(21.43)	45(64.29)	10(14.29)	60(85.71)	1(1.43)	9(12.86)	34(48.57)	18 (25.71)	18(25.71)
	χ^2	15.098			5.012			12.853		
	p	0.020*			0.542			0.045*		
	Doctor	13(21.31)	44(72.13)	4(6.56)	56(91.80)	2(3.28)	3 (4.92)	27(44.26)	17(27.87)	17(27.87)
	Master	26(18.31)	105(73.94)	11(7.75)	115(80.99)	5(3.52)	22(15.49)	72(50.70)	44(30.99)	26(18.31)
Degree	Bachelor	42(16.34)	200(77.82)	15(5.84)	222(86.38)	8(3.11)	27(10.51)	105(40.86)	102(39.69)	50(19.46)
	Associate	3(13.64)	15(68.18)	4(18.18)	20(90.91)	0(0.00)	2(9.09)	11(50.00)	5(22.73)	6(27.27)
	χ^2	5.943			6.166			8.826		
	p	0.43			0.405			0.184		
	National / ministerial	7(24.14)	20(68.97)	2(6.90)	26(89.66)	1(3.45)	2(6.90)	14(48.28)	9(31.03)	6(20.69)
	Provincial / municipality	13(14.61)	73(82.02)	3(3.37)	78(87.64)	4(4.49)	7(7.87)	37(41.57)	31(34.83)	21(23.60)
Affiliation Hierarchy	City	31(19.02)	121(74.23)	11(6.75)	134(82.21)	4(2.45)	25(15.34)	81(49.69)	53(32.52)	29(17.79)
	County / below	33(16.42)	150(74.63)	18(8.96)	175(87.06)	6 (2.99)	20 (9.95)	83(41.29)	75(37.31)	43(21.39)
	χ^2	4.994			5.296			3.513		
	p	0.545			0.507			0.742		
	Teaching hospital staff	52(16.99)	231(75.49)	23(7.52)	262(85.62)	7(2.29)	37(12.09)	140(45.75)	103(33.66)	63(20.59)
	No	32(18.18)	133(75.57)	11(6.25)	151(85.80)	8(4.55)	17(9.66)	75(42.61)	65(36.93)	36(20.45)
Teaching hospital staff	χ^2	0.345			2.421			0.591		
	p	0.842			0.298			0.744		
	Frontline staff	26(18.06)	107(74.31)	11(7.64)	121(84.03)	6(4.17)	17(11.81)	59(40.97)	55(38.19)	30(20.83)
	No	58(17.16)	257(76.04)	23(6.80)	292(86.39)	9(2.66)	37(10.95)	156(46.15)	113(33.43)	69(20.41)
	χ^2	0.186			0.866			1.274		
	p	0.911			0.648			0.529		

* $p < 0.05$.

Impacts of personal characteristics on online learning preferences through WeChat platform

In accordance with the backend database of *Jiujing* platform, the online investigation also indicated that surgery videos (450/482, 93.36%) and academic lectures (425/482, 88.17%) were the most popular sections (Fig. 2A). As in Table 3, logistic regression analysis showed that affiliation hierarchy significantly influenced the respondents' preferences in surgery videos and literature express, and titles of the respondents remarkably impacted their preferences in medical humanities and literature express. Additionally, degree and gender respectively affected their favors in online interactions and case reports.

Table 3
Logistic regression analysis of selected beneficial sections in WeChat platform

Dependent variable	Independent variable	Regression coefficient	Standard error	z value	Wald χ^2	p	OR	OR 95% CI
Surgery videos	Gender	-0.654	0.687	-0.952	0.907	0.341	0.520	0.135 ~ 1.999
	Title	-0.297	0.218	-1.361	1.853	0.173	0.743	0.484 ~ 1.140
	Degree	-0.329	0.306	-1.077	1.160	0.281	0.719	0.395 ~ 1.310
	Affiliation Hierarchy	0.699	0.256	2.726	7.434	0.006**	2.012	1.217 ~ 3.327
	Teaching hospital staff	-0.092	0.451	-0.203	0.041	0.839	0.912	0.377 ~ 2.210
	Frontline staff	0.046	0.420	0.110	0.012	0.913	1.047	0.459 ~ 2.387
Academic lectures	Gender	0.107	0.664	0.161	0.026	0.872	1.113	0.303 ~ 4.094
	Title	-0.194	0.166	-1.167	1.362	0.243	0.823	0.594 ~ 1.141
	Degree	-0.383	0.248	-1.549	2.399	0.121	0.681	0.420 ~ 1.107
	Affiliation Hierarchy	0.309	0.204	1.513	2.290	0.130	1.361	0.913 ~ 2.030
	Teaching hospital staff	-0.175	0.321	-0.545	0.297	0.586	0.840	0.448 ~ 1.575
	Frontline staff	0.183	0.310	0.591	0.349	0.555	1.201	0.655 ~ 2.203
Case reports	Gender	2.400	1.037	2.315	5.360	0.021*	11.022	1.445 ~ 84.073
	Title	0.131	0.109	1.202	1.446	0.229	1.140	0.921 ~ 1.411
	Degree	0.309	0.167	1.855	3.442	0.064	1.362	0.983 ~ 1.889
	Affiliation Hierarchy	-0.074	0.142	-0.521	0.271	0.602	0.929	0.704 ~ 1.226
	Teaching hospital staff	0.168	0.216	0.776	0.602	0.438	1.183	0.774 ~ 1.807
	Frontline staff	0.000	0.209	-0.001	0.000	1.000	1.000	0.664 ~ 1.505
Medical humanities	Gender	0.503	0.478	1.052	1.107	0.293	1.654	0.648 ~ 4.226
	Title	0.276	0.126	2.189	4.791	0.029*	1.318	1.029 ~ 1.688
	Degree	0.291	0.190	1.535	2.357	0.125	1.338	0.923 ~ 1.942
	Affiliation Hierarchy	-0.039	0.158	-0.245	0.060	0.807	0.962	0.705 ~ 1.312
	Teaching hospital staff	-0.025	0.241	-0.102	0.010	0.918	0.976	0.608 ~ 1.566
	Frontline staff	0.133	0.241	0.552	0.304	0.581	1.142	0.713 ~ 1.830
Online interactions	Gender	0.925	0.514	1.799	3.236	0.072	2.523	0.920 ~ 6.916
	Title	-0.121	0.109	-1.112	1.237	0.266	0.886	0.715 ~ 1.097
	Degree	0.375	0.167	2.246	5.045	0.025*	1.455	1.049 ~ 2.017
	Affiliation Hierarchy	-0.211	0.140	-1.508	2.274	0.132	0.809	0.615 ~ 1.065
	Teaching hospital staff	-0.111	0.212	-0.524	0.274	0.600	0.895	0.590 ~ 1.356
	Frontline staff	0.321	0.208	1.546	2.389	0.122	1.378	0.918 ~ 2.070
Literature express	Gender	0.311	0.480	0.648	0.419	0.517	1.365	0.532 ~ 3.499
	Title	0.370	0.116	3.186	10.154	0.001**	1.447	1.153 ~ 1.816
	Degree	0.044	0.170	0.257	0.066	0.797	1.045	0.748 ~ 1.459
	Affiliation Hierarchy	-0.307	0.145	-2.113	4.463	0.035*	0.736	0.554 ~ 0.978
	Teaching hospital staff	-0.431	0.226	-1.906	3.632	0.057	0.650	0.417 ~ 1.012
	Frontline staff	-0.160	0.215	-0.743	0.552	0.458	0.852	0.559 ~ 1.299
* $p < 0.05$, ** $p < 0.01$; OR: odds ratio, CI: confidence interval.								

With the upgrading of affiliation hierarchy, preferences in surgery videos and literature express accordingly depleted (Fig. 2B). As illustrated in Fig. 2C, respondents with intermediate positional titles (attending physician and assistant director physician) were more interested in medical humanities and literature express. Meanwhile, respondents with bachelor degree (128/225, 56.89%) accounted for the majority who were favor of online interactions (Fig. 2D).

Discussion

According to the 47th China Statistical Report on Internet Development (data available at <http://www.cnnic.net.cn/hlwfzyj/hlwxbzg/hlwztjbg/202102/P020210203334633480104.pdf>), by the end of 2020, the amount of online education users in China has increased 109 million compared with that in the year of 2019. The Covid-19 pandemic is forcing medical educators to re-evaluate how to educate learners of all levels [9]. Travel restrictions have brought about a preference towards online meetings in urogenital associations despite the irreplaceability of the face-to-face manner [10]. Therefore, continuing education in the time of social distancing aroused our attentions to social media such as Twitter, which have been widely used in education and conferences sharing among global urogenital communities [11]. Urogenital online learning was inevitably forced to rapidly adapt to the Covid-19 situation, urologists as well as andrologists adopted web-based platforms to develop virtual education programs to fill the gap [12]. Young and junior physicians need to learn more, while expert and senior specialists want to show more, so they get together and communicate online through social media, especially in the era of Covid-19.

As one of the most popular social media applications in China, WeChat has been playing an import role in medical education [13]. According to the backend database of *Jiujing*, one of the most well-known WeChat public platforms in Chinese urogenital community, online learning through WeChat became more fervent during the Covid-19 pandemic. Afterwards, we conducted an online questionnaire survey to explore the significances and determinants of urogenital online learning though WeChat during the Covid-19 pandemic. As expected, the majority of the respondents experienced decreased face-to-face learning opportunities during the Covid-19 pandemic and consequently triggered increased online learning demands. It was reassuring that most urologists and andrologists have benefited from online learning including those who have directly participated in the battle against Covid-19. However, compared with veteran senior physicians (director physicians), online learning was significantly more beneficial for the juniors (primary and attending physicians).

A systematic review indicated that Internet and software-based platforms for surgical training was as effective as other methods of training, but technical and infrastructural resources might be a major challenge for implementing online learning [14, 15]. Understanding various demands of the users with different backgrounds is particularly important when building an online learning platform. Whether from teaching hospital or working as frontline staffs against Covid-19 had no effect on the attitudes of the respondents. Given that medical students used to be engaged and motivated when being taught with a video-feedback and visual manner [16], surgery videos and academic lectures were the most popular sections in either *Jiujing* platform or questionnaire survey. Consistent with a previous study, the subscribers tended to pay more attention to surgical videos sections, which resulted from the decreased quantity of operations during the Covid-19 epidemic [12]. Since most users of social medias are young adults, the decreased quantity of operations is supposed to cause decreased practice opportunities especially for the inexperienced surgeons. However, the imbalance of learning resources owing to regional discrepancy has led to different attitudes towards online education [17]. Investigated benefits from surgery videos and literature express sections decreased with the hierarchical ascending of respondents' affiliations. As surgery videos and literature resources were less accessible for the physicians from grass-root hospitals, urologists and andrologists in these institutions might benefit more from online learning than that in provincial or national hospitals.

With the rapid development of medical science, online learning from literature is a complementary and essential way to update knowledge for continuing education [18]. Compared to natural science courses, dreary teaching style and limited attention are placed on medical humanities in Chinese medical education system although it has some merits: meeting basic needs, early exposure and mandatory [19]. When faced with the tension between doctors and patients, we are required to optimize our professional knowledge as well as humanistic care. Our study uncovered that online learning of literature and medical humanities were considered significantly beneficial among attending doctors and assistant director physicians, who usually took the main responsibilities to communicate with the patients in Chinese hospitals.

In order to meet the huge demand for doctors while ensure a basic minimum of quality, medical education in China used to be classified into different program durations: associate with 3 years (licensed assistant doctors), bachelor with 5 years (licensed general practitioner), master with 3 more years (licensed residency) and doctor with another 3 more years (licensed specialist physicians) [20, 21]. In the earlier years, medical undergraduates in China got access to work as licensed doctors in hospitals without systematic education and training as specialist physicians, so they obtained specialty knowledge in urology and andrology mainly relied on self-learning and communication with colleagues. It is no wonder that in our investigation, benefits from online interaction were associated with the degree of respondents: urologists and andrologists with a bachelor degree exhibited the most enthusiasms. A previous systematic review and meta-analysis revealed that face-to-face learning was no better than online learning in undergraduate medical education, but online learning had advantages to enhance undergraduates' knowledge and skills [22].

Admittedly, our work existed some limitations. There are some other WeChat platforms for urogenital online learning in China, but consistent and comparable backend data of these platforms have not been obtained and included. On the other hand, the online questionnaires were randomly given out through WeChat and collected from the target respondents. All these factors modestly restricted the representativeness of the data.

Conclusions

Even though the outbreak of Covid-19 has affected the patterns of urogenital online continuing education to a certain degree, and long-term impact of the pandemic on medical education remains unknown, urologists and andrologists in China have been applying what they had learned from the platform and shared their gains through the WeChat platform. The present work also promoted that when establishing a urogenital online education platform, the

background of target audiences should be taken into consideration. As an old saying goes, a single spark kindles a prairie fire, and similarly, an academic platform in social media ignites the light of medical continuing education.

Declarations

Funding

This study was supported by Education and Teaching Reform Research Project of Central South University (No. 2020jy149-2) to Longfei Liu.

Ethics approval and consent to participate

This study was approved by Medical Ethics Committee of the Xiangya Hospital of Centre South University and conducted in accordance with the Helsinki Declaration. All methods were carried out in accordance with relevant guidelines and regulations. Informed consent was obtained from participants.

Competing interests

The authors declared no competing interests.

Data availability statement

Data are available upon reasonable request from the corresponding author.

Consent for publication

Not applicable.

Author details

¹Department of Urology, Zhongnan Hospital of Wuhan University, Wuhan 430071, China; ²Department of Urology, Fujian Provincial Hospital, Fuzhou 350001, China; ³Department of Urology, the Chinese People's Liberation Army 118 Hospital, Wenzhou 325000, China; ⁴Department of Urology, Longyan First Affiliated Hospital of Fujian Medical University, Longyan 364000, China; ⁵Department of Urology, Hunan Provincial People's Hospital, the First Affiliated Hospital of Hunan Normal University, Changsha 410005, China; ⁶Department of Urology, the Second Clinical Hospital of North Sichuan Medical College, Nanchong 637000, China; ⁷Department of Urology, Xiangya Hospital, Central South University, Changsha 410008, China.

References

1. Chen X, Zhou X, Li H, Li J, Jiang H: The value of WeChat application in chronic diseases management in China. *Comput Methods Programs Biomed* 2020, 196:105710.
2. Cao S, Chen L, Liu Z: Disharmony between society and environmental carrying capacity: a historical review, with an emphasis on China. *Ambio* 2007, 36(5):409-415.
3. Song H, Feng D, Wang R, Tang S, Ghose B, Li G, Chen X, Feng Z: Urban-rural disparity in the utilization of national community-based hypertension monitoring service-results from the China Health and Retirement Longitudinal Study, 2015. *PeerJ* 2019, 7:e7842.
4. Loeb S, Catto J, Kutikov A: Social media offers unprecedented opportunities for vibrant exchange of professional ideas across continents. *Eur Urol* 2014, 66(1):118-119.
5. Loeb S, Bayne CE, Frey C, Davies BJ, Averch TD, Woo HH, Stork B, Cooperberg MR, Eggener SE, American Urological Association Social Media Work G: Use of social media in urology: data from the American Urological Association (AUA). *BJU Int* 2014, 113(6):993-998.
6. Wayne DB, Green M, Neilson EG: Medical education in the time of COVID-19. *Sci Adv* 2020, 6(31):eabc7110.
7. Wei Y, Liu L, Li X, Song W, Zhong D, Cao X, Yuan D, Ming S, Zhang P, Wen Y et al: Current Treatment for Low-Risk Prostate Cancer in China: A National Network Survey. *J Cancer* 2019, 10(6):1496-1502.
8. Lin XJ, Zhang D, Huang MY, Cheng H, Yu H: [Evaluation of computer-aided diagnosis system for detecting dental approximal caries lesions on periapical radiographs]. *Zhonghua Kou Qiang Yi Xue Za Zhi* 2020, 55(9):654-660.
9. Tarchichi TR, Szymusiak J: Continuing Medical Education in the Time of Social Distancing: The Case for Expanding Podcast Usage for Continuing Education. *J Contin Educ Health Prof* 2021, 41(1):70-74.
10. Hameed BZ, Tanidir Y, Naik N, Teoh JY, Shah M, Wroclawski ML, Kunjibettu AB, Castellani D, Ibrahim S, da Silva RD et al: Will "Hybrid" Meetings Replace Face-To-Face Meetings Post COVID-19 Era? Perceptions and Views From The Urological Community. *Urology* 2021.
11. Thangasamy IA, Leveridge M, Davies BJ, Finelli A, Stork B, Woo HH: International Urology Journal Club via Twitter: 12-month experience. *Eur Urol* 2014, 66(1):112-117.
12. Smigelski M, Movassaghi M, Small A: Urology Virtual Education Programs During the COVID-19 Pandemic. *Curr Urol Rep* 2020, 21(12):50.
13. Zhang W, Li ZR, Li Z: WeChat as a Platform for Problem-Based Learning in a Dental Practical Clerkship: Feasibility Study. *J Med Internet Res* 2019, 21(3):e12127.
14. Maertens H, Madani A, Landry T, Vermassen F, Van Herzele I, Aggarwal R: Systematic review of e-learning for surgical training. *Br J Surg* 2016, 103(11):1428-1437.

15. Al-Balas M, Al-Balas HI, Jaber HM, Obeidat K, Al-Balas H, Aborajoo EA, Al-TaHER R, Al-Balas B: Distance learning in clinical medical education amid COVID-19 pandemic in Jordan: current situation, challenges, and perspectives. BMC Med Educ 2020, 20(1):341.
16. Donkin R, Askew E, Stevenson H: Video feedback and e-Learning enhances laboratory skills and engagement in medical laboratory science students. BMC Med Educ 2019, 19(1):310.
17. Burrows AM, Laupland KB: Comprehensiveness of distributed medical education systems: a regional population-based perspective. BMC Med Educ 2021, 21(1):42.
18. Thangasamy IA, Loeb S, Sathianathan NJ, Leveridge M, Stork B, Davies BJ, Woo HH: Evaluating the Effectiveness of an Online Journal Club: Experience from the International Urology Journal Club. Eur Urol Focus 2019.
19. Qian Y, Han Q, Yuan W, Fan C: Insights into medical humanities education in China and the West. J Int Med Res 2018, 46(9):3507-3517.
20. Lam TP, Wan XH, Ip MS: Current perspectives on medical education in China. Med Educ 2006, 40(10):940-949.
21. Zhu J, Li W, Chen L: Doctors in China: improving quality through modernisation of residency education. Lancet 2016, 388(10054):1922-1929.
22. Pei L, Wu H: Does online learning work better than offline learning in undergraduate medical education? A systematic review and meta-analysis. Med Educ Online 2019, 24(1):1666538.

Figures

Figure 1

Impacts of Covid-19 pandemic on distributions and preferences of the subscribers in JiuJing platform. (A) Region distribution of the subscribers before Covid-19 pandemic (data by the end of 2019). (B) Region distribution of the subscribers during Covid-19 pandemic (data by the end of 2020). (C) Constituent ratios of click volumes in each section of the platform before and during Covid-19 pandemic. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

Figure 2

Impacts of personal characteristics on online learning preferences through WeChat platform. (A) Amounts of selections on each beneficial section in WeChat platform. (B) Amounts of selections from respondents with different affiliation hierarchies on surgery videos and literature express sections. (C) Amounts of selections from respondents with different positional titles on medical humanities and literature express sections. (D) Amounts of selections from respondents with different degrees on online interactions.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Table1.doc](#)
- [Table2.doc](#)
- [Table3.doc](#)