Internet appointment has more advantages than traditional appointment in the nursing service of dry eye patients

Yunyun Zou, MD[a], Ping Guo, MD[a],* , Xiaoli Zhu, MD[a], Xinhua Liu, MD[a], Na Xin, MD[a]

Abstract

Dry eye disease is one of the most common eye diseases. Clinical studies have found that meibomian gland expression can effectively improve the function of meibomian glands in patients with meibomian gland dysfunction. Compared with traditional appointments, Internet appointment has advantages in treating dry eye disease. A cross-sectional study was conducted to collect 300 patients with dry eye disease through an online questionnaire. Using Pearson chi-squared test, associations between the clinical parameters and appointment mode were analyzed. Spearman-rho test was executed to compare clinical data and appointment mode for correlation analysis and relationship between score of advantages of Internet booking (SOAIB), evaluation of the effectiveness of the Internet booking (EEIB), waiting in line for medical treatment (WMT). Univariate logistic regression analysis calculated the odds ratio (OR) of appointment mode for potential correlation factors. By using Pearson chi-squared test, SOAIB ($P = .005$), EEIB ($P = .029$) and WMT ($P = .041$) was significantly correlated with the appointment mode. Spearman correlation coefficient displayed that appointment mode was significantly correlated with EEIB ($\rho = -0.126$, $P = .029$) and WMT ($\rho = 0.118$, $P = .041$). Univariate logistic regression and concludes that EEIB (OR = 0.183, 95%CI: 0.033–1.004, $P = .05$), WMT (OR = 2.543, 95%CI: 1.013–6.384, $P = .047$) have a clear correlation with appointment mode. Spearman correlation coefficient displayed that SOAIB was significantly correlated with EEIB ($\rho = -0.247$, $P < .001$) and WMT ($\rho = 0.157$, $P = .006$). Internet appointment can effectively reduce the waiting time for dry eye disease treatment by meibomian gland expression. Effectiveness evaluation of Internet appointments is significantly higher than traditional appointments.

Abbreviations: DED = dry eye disease, EEIB = evaluation of the effectiveness of the Internet booking, ORs = odds ratios, SOAIB = score of advantages of Internet booking, WMT = waiting in line for medical treatment, 95% CIs = 95% confidence intervals.

Keywords: dry eye disease, Internet appointment, meibomian gland expression, traditional appointment

1. Introduction

Dry eye disease (DED) is one of the most common eye diseases. Dry eye occurs when there is inadequate tear volume or function, resulting in an unstable tear film and ocular surface disease. It is a widespread condition, particularly in postmenopausal women and the elderly. It is a multifactorial disease of the ocular surface and tears film, causing eye discomfort, visual impairment, tearing instability, and possibly damaging the cornea and conjunctiva.[1–3] DED prevalence in the Chinese population over 40 years old ranges from 21% to 50.1%.[4–6]

Meibomian gland expression is a treatment for DED by promoting the drainage of obstruent meibomian secretion, usually with the help of glass rods, chalazion clamps, strabismus hooks, and other tools.[7–9] It is generally recommended to carry out after a hot compress and squeeze the upper and lower meibomian glands. It has been used to treat DED for at least 90 years. Clinical studies have found that meibomian gland expression can effectively improve the function of meibomian glands in patients with meibomian gland dysfunction. The intervention of meibomian gland expression can effectively enhance the meibomian gland secretion scores, the tear breakup time, and the ocular surface function.

Ophthalmology consultation is mainly an outpatient service, while doctor's consultation and meibomian gland expression are usually not in the same consultation room. Patients may need to see a doctor after a long wait and then go to another consultation room to queue up for Meibomian gland expression, which spending too much time. At the same time, the traditional way

of registration, which usually refers to queuing, is difficult to be accepted with a long waiting time. The waiting time for registration is generally longer than the consultation time. Furthermore, in the traditional registration model, patients still need to queue up for registration after making an appointment. Patients may conflict with walk-in patients due to various issues when making an appointment. The degree of satisfaction with the diagnosis and treatment is low, and the outpatient clinic is in disorder, which virtually increases the work pressure of the medical staff.

Recently, with the rapid development of Internet technology, the application of the Internet in the medical field is gradually increasing, forming a new medical appointment model with the use of information technology, which providing patients with various forms of diagnosis and treatment. At the same time, with the help of various self-service terminals, the outpatient service flow is optimized, manual service is reduced, the pressure of staff is reduced, and the waiting time of patients is shortened. Patients can register, make an appointment, pay the cost and take medicine according to their own needs, which facilitates the reasonable arrangement to hospital time. In addition, patients can inquire and check reports through self-service report inquiry machine, WeChat Official Account, Alipay life number, etc. Some self-service reports can provide a printing function. Currently, there are 2 main types of Web-based medical appointment services, medical scheduling software (SaaS) as a service and proprietary Web-based scheduling systems. In recent years, more and more attention has been paid to medical scheduling SaaS.[3] Patients can get an appointment number. Patients arrive at the hospital and get registered with the appointment number at the appointed appointment time. These patients don't have to wait in line at the registration window.[10]

The relationship between dry eye syndrome and Internet appointments and traditional appointments primarily involves the way patients access eye care and the treatment process. Dry eye syndrome patients often require regular visits to an ophthalmologist for monitoring and managing their symptoms. Internet appointments booking offers a more convenient method, eliminating the cumbersome process of phone calls and waiting times.

Dry eye syndrome typically necessitates regular follow-up appointments due to the potential fluctuations in symptoms. Internet appointments make it easier for patients to schedule these follow-ups, ensuring timely access to treatment and advice. Internet appointments systems usually maintain records of a patient's medical history and symptom descriptions, which are crucial for the long-term management of dry eye syndrome. Physicians can more easily review a patient's history to understand the progression of the condition and changes in symptoms. Internet appointments can be used to provide patients with information and recommendations related to dry eye syndrome, along with regular appointment reminders. This helps patients gain a better understanding of the disease and ensures they do not miss important appointments. Therefore, this study aims to compare traditional appointments and Internet appointments in meibomian gland expression through a cross-sectional investigation.

2. Methods

2.1. Basic information

A cross-sectional study was conducted to collect 300 patients with DED through an online questionnaire. The home page of the questionnaire included the completion of this survey to let us know that you agree to participate in this study. The questionnaire included appointment methods, health concerns, queuing time, and prognosis of dry eye disease (Data S1, Supplemental Digital Content, http://links.lww.com/MD/K901). This study was approved by the Ethics Committee of the Shenzhen Eye Hospital (SZYKYY20190821). The research conformed to the Declaration of Helsinki.

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) patients who have been diagnosed with dry eye disease by a medical professional; (2) have received meibomian gland expression therapy; (3) obtain informed consent of patients.

Exclusion criteria: (1) the primary information in the questionnaire included gender, age, eyelid gland treatment, and other significant missing items; (2) repeat submission of the same patient information.

2.3. Statistical method

Count data is represented by numerical values and percentages of the total number. Chi-squared test is used to judge the difference of clinical characteristics under different appointment modes. Since the data itself is counting data, there is no linear correlation. We performed Spearman rho test to compare clinical data and appointment modes, so as to conduct correlation analysis and the relationship between appointment modes (score of advantages of Internet booking [SOAIB], evaluation of the effectiveness of the Internet booking [EEIB], and waiting in line for medical treatment [WMT]). Univariate logistic regression analysis calculated the OR of appointment mode for potential correlation factors.

All statistical analyses were conducted using SPSS software, version 21.0 (IBM Corp., Armonk, NY). A P-value $< .05$ was considered statistically significant.

3. Results

3.1. Associations between characteristics and appointment mode based on χ^2 test

Table 1 summarized the associations between potentially clinical parameters and appointment mode according to the Pearson chi-squared test. Among the individuals, SOAIB ($P = .005$), EEIB ($P = .029$) and WMT ($P = .041$) was significantly correlated with the appointment mode. However, sex ($P = .523$), age ($P = .325$), health concern ($P = .443$), independent medical ($P = .376$), history of similar APP ($P = .064$), score of disadvantages of Internet booking ($P = .625$), internet better than tradition ($P = .117$), IIC ($P = .681$), treatment expense ($P = .664$), escorts ($P = .121$), overall treatment time ($P = .504$), prognostic effect ($P = .648$) had no significant correlation with appointment mode (Table 1).

3.2. Further associations between potential characteristics and appointment mode by Spearman correlation test

To confirm whether the potentially correlative characteristics in patients with xerophthalmia have a significant impact on appointment mode, a further correlation analysis was performed. Spearman correlation coefficient displayed that appointment mode was significantly correlated with EEIB ($\rho = -0.126$, $P = .029$) and WMT ($\rho = 0.118$, $P = .041$). However, there were no further associations between sex ($\rho = 0.037$, $P = .523$), age ($\rho = -0.057$, $P = .325$), health concern ($\rho = 0,044$, $P = .443$), independent medical ($\rho = -0.051$, $P = .376$), history of similar APP ($\rho = -0.107$, $P = .064$), SOAIB ($\rho = 0.043$, $P = .462$), score of disadvantages of Internet booking ($\rho = -0.043$, $P = .454$), internet better than tradition ($\rho = -0.090$, $P = .118$), IIC ($\rho = -0.024$, $P = .683$), treatment expense ($\rho = -0.025$, $P = .665$), escorts ($\rho = 0.089$, $P = .122$), overall treatment time ($\rho = 0.039$, $P = .506$), prognostic effect ($\rho = 0.026$, $P = .649$) (Table 2).

3.3. Univariate logistic regression for the correlative factors for appointment mode

In addition, our study used univariate logistic regression to determine the association between correlative parameters and the appointment mode, ORs and 95% confidence intervals (95%

Table 1

Characteristics of patients with xerophthalmia and appointment mode.

		Appointment mode		
Characteristics		**Traditional (%)**	**Internet (%)**	***P***
Sex				
Male	91	8 (2.7%)	83 (27.7%)	.523
Female	209	14 (4.7%)	195 (65.0%)	
Age				
Low	153	9 (3.0%)	144 (48.0%)	.325
High	147	13 (4.3%)	134 (44.7%)	
Health concern				
Great attention	225	18 (6.0%)	207 (69.0%)	.443
General or no	75	4 (1.3%)	71 (23.7%)	
Independent medical				
Yes	294	21 (7.0%)	273 (91.0%)	.376
No	6	1 (0.3%)	5 (1.7%)	
History of similar APP				
Yes		12 (4.0%)	203 (67.7%)	.064
No		10 (3.3%)	75 (25.0%)	
SOAIB				
1	6	1 (0.3%)	5 (1.7%)	.005*
2	3	0 (0.0%)	3 (1.0%)	
3	18	5 (1.7%)	13 (4.3%)	
4	62	1 (0.3%)	61 (20.3%)	
5	211	15 (5.0%)	196 (65.3%)	
SODIB				
1	140	9 (3.0%)	131 (43.7%)	.625
2	54	3 (1.0%)	51 (17.0%)	
3	42	5 (1.7%)	37 (12.3%)	
4	25	1 (0.3%)	24 (8.0%)	
5	39	4 (1.3%)	35 (11.7%)	
EEIB				
Satisfaction	293	20 (6.7%)	273 (91.0%)	.029*
Dissatisfaction	7	2 (0.7%)	5 (1.7%)	
Internet better than tradition				
Yes	282	19 (6.3%)	263 (87.7%)	.117
No	18	3 (1.0%)	15 (5.0%)	
IIC				
Yes	267	19 (6.3%)	248 (82.7%)	.681
No	33	3 (1.0%)	30 (10.0%)	
WMT				
Long	59	8 (2.7%)	51 (17.0%)	.041*
Moderation	241	14 (4.7%)	227 (75.7%)	
Treatment expense				
<1000RMB	255	18 (6.0%)	237 (79.0%)	.664
≥1000RMB	45	4 (1.3%)	41 (13.7%)	
Escorts				
No	233	20 (6.7%)	213 (71.0%)	.121
Yes	67	2 (0.7%)	65 (21.7%)	
Overall treatment time				
<3 h	275	21 (7.0%)	254 (84.7%)	.504
≥3 h	25	1 (0.3%)	24 (8.0%)	
Prognostic effect				
Else	136	11 (3.7%)	125 (41.7)	.648
Effective	164	11 (3.7%)	153 (51.0%)	

Pearson chi-squared test was used.

EEIB = evaluation of the effectiveness of Internet booking, IIC = Internet medical treatment can improve the condition of medical treatment and health quality, SOAIB = score of advantages of Internet booking, SODIB = score of disadvantages of Internet booking, WMT = waiting in line for medical treatment.

*P < .05.

CIs), in order to further determine the correlative factors and the appointment mode. Table 3 describes the ORs and 95% CI of the study subjects at the univariate level using univariate logistic regression and concludes that EEIB (OR = 0.183, 95%CI: 0.033–1.004, *P* = .05), WMT (OR = 2.543, 95%CI: 1.013–6.384, *P* = .047) have a clear correlation with appointment mode. However, there is no disadvantageous between internet better than tradition (OR = 0.361, 95%CI: 0.096–1.358, *P* = .132), IIC (OR = 0.766, 95%CI: 0.214–2.742, *P* = .682), treatment expense (OR = 0.778, 95%CI: 0.251–2.417, *P* = .665), escorts

(OR = 3.052, 95%CI: 0.695–13.404, *P* = .140), overall treatment time (OR = 1.984, 95% CI: 0.256–15.402, *P* = .512) prognostic effect (OR = 1.224, 95% CI: 0.514–2.917, *P* = .648) and appointment mode (Table 3).

3.4. Further associations between SOAIB, EEIB, and WMT by Spearman correlation test

A further correlation analysis was performed to confirm whether the potentially correlative between EEIB, WMT, and

Table 2

The relationship between characteristics of patients and appointment mode.

Characteristics	Appointment mode	
	ρ	P
Sex	0.037	.524
Age	−0.057	.327
Health concern	0.044	.445
Independent medical	−0.051	.377
History of similar APP	−0.107	.064
SOAIB	0.043	.462
SODIB	−0.043	.454
EEIB	−0.126	.029*
Internet better than tradition	−0.090	.118
IIC	−0.024	.683
WMT	0.118	.041*
Treatment expense	−0.025	.665
Escorts	0.089	.122
Overall treatment time	0.039	.506
Prognostic effect	0.026	.649

Spearman correlation test was used.

EEIB = evaluation of the effectiveness of Internet booking, IIC = internet medical treatment can improve the condition of medical treatment and health quality, SOAIB = score of advantages of Internet booking, SODIB = score of disadvantages of Internet booking, WMT = waiting in line for medical treatment.

*P < .05.

Table 3

Appointment mode on characteristics of patients with xerophthalmia by logistic regression analysis.

Characteristics		Appointment mode	
		Traditional	Internet
EEIB	OR	1	0.183
	95%CI		0.033–1.004
	P	.05*	
Internet better than tradition	OR	1	0.361
	95%CI		0.096–1.358
	P	.132	
IIC	OR	1	0.766
	95%CI		0.214–2.742
	P	.682	
WMT	OR	1	2.543
	95%CI		1.013–6.384
	P	.047*	
Treatment expense	OR	1	0.778
	95%CI		0.251–2.417
	P	.665	
Escorts	OR	1	3.052
	95%CI		0.695–13.404
	P	.140	
Overall treatment time	OR	1	1.984
	95%CI		0.256–15.402
	P	.512	
Prognostic effect	OR	1	1.224
	95%CI		0.514–2.917
	P	.648	

95% CI = 95% confidence interval.

EEIB = evaluation of the effectiveness of Internet booking, IIC = Internet medical treatment can improve the condition of medical treatment and health quality, OR = odds ratio, SOAIB = score of advantages of Internet booking, SODIB = score of disadvantages of Internet booking, WMT = waiting in line for medical treatment.

*P < .05.

SOAIB. Spearman correlation coefficient displayed that SOAIB was significantly correlated with EEIB (ρ = −0.247, P < .001) and WMT (ρ = 0.157, P = .006) (Table 4).

Table 4

The relationship between SOAIB, EEIB, and WMT.

Characteristics	SOAIB	
	ρ	P
EEIB	−0.247	<.001*
WMT	0.157	.006*

Spearman correlation test was used.

EEIB = evaluation of the effectiveness of the Internet booking, SOAIB = score of advantages of Internet booking, WMT = waiting in line for medical treatment.

*P < .05.

4. Discussion

The Internet appointment can effectively reduce the waiting time for DED treatment by meibomian gland expression compared with the traditional appointment. The effectiveness evaluation of the Internet appointment is significantly higher than the traditional appointment. Internet appointments can effectively reduce the waiting time for treatment.[11,12] The Internet-based appointment system has reportedly reduced the average waiting time of one hospital in China from 98 minutes to 7 minutes, as patients do not need to wait in line for an appointment when using WIS. The results show that compared with the standard queuing methods, the network-based appointment system can significantly improve patients' satisfaction with registration and effectively shorten the total waiting time.[10,13,14] A total of 36 articles discussed 21 Web-based appointment systems. Most practices that adopt Web-based scheduling show positive changes in metrics such as reduced no-show rates, reduced labor for staff, reduced wait times, and improved satisfaction.[15] Siddiqui et al reported a 6.9% absence rate for dermatology appointments with ZocDoc, significantly lower than the 17% to 31% absence rate for traditional appointments.[3] The UK's national online e-recommendation and booking service, Select and Book, reported significantly higher attendance rates than the traditional appointment method (95%CI 4.3, 20.5%, P < .01)[16]

Compared with traditional queuing registration, appointment registration has many advantages. The appointment registration system conveniently allows patients to avoid the long queues traditionally required.[17,18]

In 1 survey, 93% (891/957) reported that the patient portal was easy to use, 51% (492/975) said that time was saved when scheduling appointments and 40% (382/957) reported having to repeat less during the appointment. Respondents reported changes in health system use related to patient portals, with 48% (462/957) reporting not attending a clinic and 2.7% (26/957) avoiding emergency room visits. Of the 19,968 visits to clinics where the patient portal was introduced, 9.5% (858/9021) of non-patient portal users visited missed appointments. In contrast, the non-appointment rate for patient portal users was 4.5% (493/9021), a relative decrease of 53%.[19]

Some studies have shown (10/21) that the most cited positive change (Internet appointment) was "reduced staff labor," Followed by the "satisfaction" (7/21), "improving efficiency" (6/21), "don't show up," (6/21), "reduce waiting time" (6/21), "income" (4/21), "the increasingly popular" (4/21), "reduce cost" (3/21), "balance the burden of patients (1/21)," And "reducing the number of wrong dating types" (1 in 21).[15] This study shows that the use of AIS can significantly improve patient satisfaction with outpatient enrollment. While it still takes some time to make an appointment using WAS, it can significantly reduce the total wait time, especially invalid wait times[10]

eTriage is a new, safe, Web-based service designed to increase people's visits to clinics. It has proved to be a popular booking method, offering 10 percent of all bookings within 6 months of its launch. The KC 60 analysis showed that most users (58%)

underwent asymptomatic screening, and the remaining patients had some degree of pathologic examination. Human papillomavirus, chlamydia, nonspecific urethritis, gonorrhea, herpes, and trichomonas are more prevalent than in the general clinical population. The review of the notes showed a high degree of agreement (97%) between the data entered in the electronic classification register and the clinical review. A survey of patients showed a high level of satisfaction with the service. As adjacent to the existing booking service, the electronic sorting service has helped to increase patient choice and proved to be a safe, efficient, and effective way to improve patient use.[20]

Since October 2015, Guangzhou Maternal and Child Medical Center have implemented a comprehensive appointment service for nonemergency registration. Except for emergency and isolated patients in the outpatient department, other patients can use any of the following methods to make an appointment: mobile phone (WeChat public platform, Alipay of Guangzhou Women and Children's Medical Center), Yicheng Tong app (mobile app), hospital website, appointment registration between outpatients or post-discharge visit, telephone, and on-site self-service terminals. Studies show that patient waiting time is significantly reduced with implementing a nonemergency comprehensive booking service. The proportion of patients who thought waiting time needed improvement decreased, and outpatient satisfaction increased significantly. The total number of outpatients before the implementation of comprehensive appointment service is lower than before the implementation of comprehensive appointment service, indicating that the number of outpatients has been effectively controlled. After implementing the comprehensive appointment service for nonemergency registration, the medical service process has been simplified and optimized through mobile registration and payment.[21]

However, this study also had some shortcomings, as the cross-sectional design was used for population-based surveys and to assess the prevalence of the disease in a clinical sample. These studies can often be done quickly and cheaply.[22,23] However, it is challenging to derive causality from a cross-sectional analysis because exposure and outcomes are measured. In addition, these studies are prone to certain biases.[24] Therefore, we must be careful to interpret associations and directions of relationships from cross-sectional surveys. Finally, the prevalence of cross-sectional results depends on disease incidence and survival after the results.[25]

In conclusion, Internet appointments can effectively reduce the waiting time for DED treatment by meibomian gland expression compared with traditional appointments. The effectiveness evaluation of the Internet appointment is significantly higher than the traditional appointment. Utilizing the internet for appointments has the potential for numerous practical applications. Internet appointment enhance convenience and accessibility, ensure accurate record-keeping, reducing the possibility of human errors and helping to avoid confusion and unnecessary disputes. Users can select their appointment times, allowing for better time management, which improves efficiency and reduces unnecessary wait times. It can also reduce the use of paper and other resources, contributing to a more eco-friendly approach, and ultimately, lowering the environmental impact. Internet appointment significantly enhance customer satisfaction.

Author contributions

Conceptualization: Yunyun Zou, Ping Guo.
Data curation: Ping Guo, Xiaoli Zhu, Na Xin, Xinhua Liu.
Formal analysis: Ping Guo, Xiaoli Zhu, Na Xin, Xinhua Liu.
Methodology: Yunyun Zou, Ping Guo, Xiaoli Zhu, Xinhua Liu.
Project administration: Yunyun Zou.
Supervision: Yunyun Zou.
Writing – review & editing: Yunyun Zou, Ping Guo.
Writing – original draft: Ping Guo, Na Xin, Xinhua Liu.

References

[1] The definition and classification of dry eye disease: report of the Definition and Classification Subcommittee of the International Dry Eye WorkShop (2007). Ocul Surf. 2007;5:75–92.

[2] Kaštelan S, Tomić M, Salopek-Rabatić J, et al. Diagnostic procedures and management of dry eye. Biomed Res Int. 2013;2013:309723.

[3] Siddiqui Z, Rashid R. Cancellations and patient access to physicians: ZocDoc and the evolution of e-medicine. Dermatol Online J. 2013;19:14.

[4] Guo B, Lu P, Chen X, et al. Prevalence of dry eye disease in Mongolians at high altitude in China: the Henan eye study. Ophthalmic Epidemiol. 2010;17:234–41.

[5] Jie Y, Xu L, Wu YY, et al. Prevalence of dry eye among adult Chinese in the Beijing Eye Study. Eye (Lond). 2009;23:688–93.

[6] Lin PY, Cheng CY, Hsu WM, et al. Association between symptoms and signs of dry eye among an elderly Chinese population in Taiwan: the Shihpai Eye Study. Invest Ophthalmol Vis Sci. 2005;46:1593–8.

[7] Bilkhu P, Vidal-Rohr M, Trave-Huarte S, et al. Effect of meibomian gland morphology on functionality with applied treatment. Cont Lens Anterior Eye. 2021;45:101402.

[8] Han D, Kim H, Kim S, et al. Comparative study on the effect of hyperthermic massage and mechanical squeezing in the patients with mild and severe meibomian gland dysfunction: an interventional case series. PLoS One. 2021;16:e0247365.

[9] Rong B, Tu P, Tang Y, et al. [Evaluation of short-term effect of intense pulsed light combined with meibomian gland expression in the treatment of meibomian gland dysfunction]. Zhonghua Yan Ke Za Zhi. 2017;53:675–81.

[10] Cao W, Wan Y, Tu H, et al. A web-based appointment system to reduce waiting for outpatients: a retrospective study. BMC Health Serv Res. 2011;11:318.

[11] Zhang M, Zhang C, Sun Q, et al. Questionnaire survey about use of an online appointment booking system in one large tertiary public hospital outpatient service center in China. BMC Med Inform Decis Mak. 2014;14:49.

[12] Zhang X, Yu P, Yan J, et al. Patients' perceptions of web self-service applications in primary healthcare. Stud Health Technol Inform. 2012;178:242–9.

[13] Chen BL, Li ED, Yamawuchi K, et al. Impact of adjustment measures on reducing outpatient waiting time in a community hospital: application of a computer simulation. Chin Med J (Engl). 2010;123:574–80.

[14] Zhang X, Yu P, Yan J, et al. Using diffusion of innovation theory to understand the factors impacting patient acceptance and use of consumer e-health innovations: a case study in a primary care clinic. BMC Health Serv Res. 2015;15:71.

[15] Zhao P, Yoo I, Lavoie J, et al. Web-based medical appointment systems: a systematic review. J Med Internet Res. 2017;19:e134.

[16] Parmar V, Large A, Madden C, et al. The online outpatient booking system "Choose and Book" improves attendance rates at an audiology clinic: a comparative audit. Inform Prim Care. 2009;17:183–6.

[17] Online scheduling applications may improve customer satisfaction, but setup is not always easy. Internet Healthc Strateg. 2004;6:1–5.

[18] Zhang X, Yu P, Yan J. Patients' adoption of the e-appointment scheduling service: a case study in primary healthcare. Stud Health Technol Inform. 2014;204:176–81.

[19] Graham T, Ali S, Avdagovska M, et al. Effects of a web-based patient portal on patient satisfaction and missed appointment rates: survey study. J Med Internet Res. 2020;22:e17955.

[20] Jones R, Menon-Johansson A, Waters AM, et al. eTriage—a novel, web-based triage and booking service: enabling timely access to sexual health clinics. Int J STD AIDS. 2010;21:30–3.

[21] Xie W, Yang X, Cao X, et al. Effects of a comprehensive reservation service for non-emergency registration on appointment registration rate, patient waiting time, patient satisfaction and outpatient volume in a tertiary hospital in China. BMC Health Serv Res. 2019;19:782.

[22] Chen JS, Roberts CL, Ford JB, et al. Cross-sectional reporting of previous Cesarean birth was validated using longitudinal linked data. J Clin Epidemiol. 2010;63:672–8.

[23] Plotnikov D, Guggenheim JA. Mendelian randomisation and the goal of inferring causation from observational studies in the vision sciences. Ophthalmic Physiol Opt. 2019;39:11–25.

[24] Rojas-Rueda D, Vaught E, Buss D. Why a new research agenda on green spaces and health is needed in Latin America: results of a systematic review. Int J Environ Res Public Health. 2021;18:5839.

[25] Setia MS. Methodology series module 3: cross-sectional studies. Indian J Dermatol. 2016;61:261–4.