

User perceptions of COVID-19 telemedicine testing services, disease risk, and pandemic preparedness: findings from a private clinic in Hong Kong

Kevin KC Hung, Emily YY Chan *, Eugene SK Lo, Zhe Huang, Justin CY Wu, Colin Alexander Graham

ABSTRACT

Introduction: During the coronavirus disease 2019 (COVID-19) pandemic, telemedicine has been regarded as a method for providing safe access to healthcare. Here, we explored the experiences of individuals using telemedicine in Hong Kong during the COVID-19 pandemic to understand their risk perceptions and preparedness measures.

Methods: We conducted a cross-sectional online survey of telemedicine users of private clinic-based COVID-19 testing services from 6 April to 11 May 2020. All users were invited to complete an anonymous online survey regarding COVID-19 risk perception and preparedness measures. The results of the survey were compared with the findings of a previous territory-wide survey.

Results: In total, 141 of 187 telemedicine users agreed to participate; the response rate was 75.4%. Of the participants, 95.1% (116/122) believed that telemedicine consultations were useful. Nearly half of the participants (49.0%) agreed or strongly agreed that telemedicine consultations were appropriate during the COVID-19 pandemic. Most participants believed that telemedicine consultations could perform the functions of 'health protection, promotion and disease prevention' (73.6%) and 'diagnosis' (64.0%). Concerning the choice of telemedicine provider, almost all participants

(99.2%) were willing to consult medical doctors; more than half of the participants (54.1%) were willing to consult registered nurses, but only 13.1% were willing to consult non-clinical staff who had been trained to provide telemedicine services.

Conclusion: The use of telemedicine for screening and patient education can be encouraged during the COVID-19 pandemic in Hong Kong.

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New knowledge added by this study

- Telemedicine use in Hong Kong was limited before the pandemic, but telemedicine users had high satisfaction with coronavirus disease 2019 (COVID-19) testing services.
- Most participants believed that the telemedicine consultations could perform the functions of 'health protection, promotion and disease prevention' and 'diagnosis'.
- Among telemedicine users, the preferred channels of infectious disease information were the internet or mobile applications as well as personal sources (eg, family, friends, or healthcare professionals).

Implications for clinical practice or policy

- Telemedicine users in this study were relatively young; previous reports suggest that these users are less likely to use healthcare in the absence of telemedicine and less likely to have a follow-up visit in any setting, compared with patients who visit a clinic for a similar condition. The use of telemedicine services might provide opportunities for healthcare access that are not otherwise available.
- Additional training for telemedicine providers might be needed to improve the quality and scope of telemedicine services.
- The use of telemedicine for screening and patient education can be encouraged during the COVID-19 pandemic in Hong Kong and elsewhere.

Introduction

In the early days of the coronavirus disease 2019 (COVID-19) pandemic, telemedicine was recommended as a solution to provide safe access to healthcare.¹ In 2020, the World Health Organization reported that most global health authorities regarded telemedicine as a potential method to provide services for patients with non-communicable diseases.² For example, in a national survey of healthcare providers in Germany, approximately 60% of participants reported routine or partial use of telemedicine during the COVID-19 pandemic.³ In the US in 2020, telemedicine was used for COVID-19 screening, monitoring of patients with positive COVID-19 test results, management of chronic diseases, and virtual monitoring and follow-up.⁴ Telemedicine reduces patient travel costs and improves access, while reducing the use of personal protective equipment and the risk of COVID-19 transmission. In China, 'internet hospitals' offered essential medical support to the public during the early days of the COVID-19 pandemic.⁵

However, from a patient perspective, there are limitations and barriers to the use of telemedicine. A qualitative study conducted in Hong Kong in 2016⁶ revealed that patient concerns included technical and logistical issues (eg, difficulty in accessing and using computers), limited personal interactions (eg, lack of in-person physical examinations and risk of incorrect diagnosis related to poor communication), concerns regarding cybersecurity and safety, and problems with prescriptions (eg, distrust of local community pharmacies). In 2020, clinical guidelines were published concerning the performance of remote primary care assessments and treatments for patients with suspected COVID-19 in the United Kingdom.⁷ During the COVID-19 pandemic, a digital health ecosystem may benefit the healthcare system, as well as the broader population (eg, through tracking and communication strategies) and research and health technology sectors (eg, online activity monitoring and digital support for isolation and quarantine situations).⁸

Telemedicine consists of remote healthcare service delivery by healthcare professionals for diagnosis, treatment, and prevention efforts, as well as research and continuing education.⁹ The fundamental goal of telemedicine is to increase access to care, thereby serving populations that otherwise would not receive timely medical evaluation and treatment. Research concerning telemedicine effectiveness has been controversial.¹⁰⁻¹⁴ A previous systematic review found that many studies showed no difference between telemedicine and usual care, and there remains limited evidence concerning the cost-effectiveness of telemedicine.¹⁰ With respect to chronic disease management via telemedicine, another review found publication

新冠肺炎遙距醫療測試服務使用者的看法、感染風險及對大流行的防範：香港一所私營診所的調查結果

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簡介：在新冠肺炎大流行期間，遙距醫療被視為能為使用者提供醫療保健服務的安全方式。本研究探討該期間香港的遙距醫療使用者的體驗，以了解他們對感染風險的看法及防範措施。

方法：我們於2020年4月6日至5月11日期間進行了橫斷面網上調查，對象是一所私營診所的新冠肺炎測試服務的遙距醫療使用者。所有使用者均獲邀參與關於對新冠肺炎感染風險的看法及防範措施的不記名網上調查。我們把相關調查結果與早前一項全港性調查結果比較。

結果：在187名遙距醫療使用者中，共有141名同意參與調查，回應率為75.4%。95.1%受訪者（116/122）認為遙距醫療診症有用，近半（49.0%）同意或十分同意遙距醫療診症在新冠疫情期間是適合的。大部分受訪者認為遙距醫療診症能做到「保障健康、促進健康及預防疾病」（73.6%）和「診斷」（64.0%）兩項功能。在遙距醫療服務提供者的選擇方面，幾乎全部受訪者（99.2%）願意諮詢醫生；過半（54.1%）願意諮詢註冊護士，但只有13.1%願意諮詢可提供遙距醫療服務的經受訓非臨床人員。

結論：本港在新冠肺炎大流行期間可加強使用遙距醫療進行篩查及患者教育。

bias and a tendency to report only short-term outcomes.¹¹ Moreover, a Cochrane review revealed improved control of blood glucose among patients with diabetes using telemedicine, compared with patients receiving in-person care; conversely, the care modality did not affect health outcomes among patients with heart failure.¹² Regarding the impacts and costs of telemedicine services, economic analyses have been problematic because of complex and unpredictable collaborative achievement processes¹³; generalisability has been limited by poor quality and low reporting standards.¹⁴ There is a need to focus on patient perspectives and telemedicine innovations.

In 2020, the health system in Hong Kong was considerably impacted by COVID-19 transmission risk and public health responses.¹⁵ During the early days of the COVID-19 pandemic, the number of in-person medical consultations decreased worldwide.^{16,17} In the Netherlands, the use of telemedicine offset this decrease.¹⁷ Before the COVID-19 pandemic, telemedicine was not widely used in Hong Kong^{6,18}; user perspectives concerning the role of telemedicine during the COVID-19 pandemic and future pandemics require investigation. This study of telemedicine users in Hong Kong explored their perceptions of telemedicine use during the COVID-19 pandemic,

their perceptions of disease risk, and their COVID-19 preparedness measures. We hypothesised that telemedicine users have distinct perceptions of risk, compared with the general public; we sought to determine the effects of such differences on the delivery of health services.

Methods

We conducted a cross-sectional online survey from 6 April to 11 May 2020. Participants in this study were users of COVID-19 testing services provided by The Chinese University of Hong Kong (CUHK) Medical Clinic,¹⁹ a multispecialty clinic offering specialist consultations, health screenings, vaccinations, and COVID-19 testing services.

Testing services and recruitment procedure

All service users completed a telemedicine consultation, followed by COVID-19 testing. The consultation, delivered using a standard telephone, focused on assessment of the user’s COVID-19 risk prior to the time of testing. Users were offered a deep throat saliva test for COVID-19 detection. After the telemedicine consultation and COVID-19 test, all users were invited to complete an anonymous online survey within 1 month for service evaluation and data collection.

Survey design

The online survey consisted of 24 questions regarding telemedicine services, COVID-19 risk perception, and preparedness measures in Hong Kong. The survey specifically focused on reasons for using CUHK telemedicine and testing services, user perceptions and attitudes regarding telemedicine consultations, user perceptions and attitudes regarding the COVID-19 pandemic and prevention, and user characteristics (eg, age and sex). Questions about user perceptions and attitudes regarding the current COVID-19 pandemic and prevention were phrased in a manner identical to a previous study,²⁰ allowing direct comparison with survey results from a study focused on the Hong Kong general public. The survey was pilot tested and subsequently modified to ensure content validity. Most questions included ‘yes’ or ‘no’ answers and a 5-point Likert scale. Written consent to take part in the study was obtained from all participants before they began the survey.

Statistical analysis

Descriptive statistics were reported for participant characteristics, perceptions, and attitudes regarding telemedicine consultations. Perceptions and attitudes regarding the COVID-19 pandemic and prevention were recorded in a manner that allowed comparison with the results of a prior COVID-19–

focused telephone survey of the Hong Kong general public.²⁰ The prior telephone survey—a cross-sectional, population-based landline telephone survey using a computerised random-digit dialling method—included 765 adult Hong Kong residents during the period from 22 March to 1 April 2020. The participants in that study were representative of Hong Kong Census population data with respect to age, sex, marital status, and residential district, although they had higher levels of education and household income.²⁰ Chi squared tests were used for comparisons between the prior survey and the present survey. The threshold of statistical significance was set at 0.05. All statistical analyses were conducted using SPSS (Windows version 21.0; IBM Corp, Armonk [NY], US).

Results

Among 187 telemedicine users of COVID-19 testing services at the CUHK Medical Clinic, we identified 150 responses to the online survey during the period from 6 April to 11 May 2020. In total, 141 telemedicine users (response rate of 75.4%) were willing to participate in this study. Table 1 shows the participants’ characteristics. Notably,

TABLE 1. Characteristics of telemedicine users in this study*

	No. (%)
Age group, y (n=138)	
18-24	70 (50.7%)
25-44	55 (39.9%)
45-64	13 (9.4%)
Sex (n=139)	
Female	61 (43.9%)
Male	78 (56.1%)
Housing (n=128)	
Public	28 (21.9%)
Subsidised	14 (10.9%)
Private	76 (59.4%)
Others	10 (7.8%)
District (n=136)	
Hong Kong Island	14 (10.3%)
Kowloon	33 (24.3%)
New Territories	89 (65.4%)
Have family member with a chronic health condition (n=139)	
No or don’t know	124 (89.2%)
Yes	15 (10.8%)

* The total number of respondents of the questions were different from the total sample of 141 due to missing data

56.1% were men, over half (50.7%) were aged 18 to 24 years (all participants were aged <65 years), most (59.4%) lived in private housing, and most (65.4%) resided in the New Territories. The most common reason for COVID-19 testing was a work-related requirement (56.7%, 80/141), followed by recent international travel (39.7%, 56/141); 14.9% (21/141) of the participants sought testing because of concerns about the spread of COVID-19. Overall, 14.2% (20/141) of the participants had either been in close contact with a confirmed case or suspected that they had symptoms of COVID-19.

Perceptions of telemedicine consultations

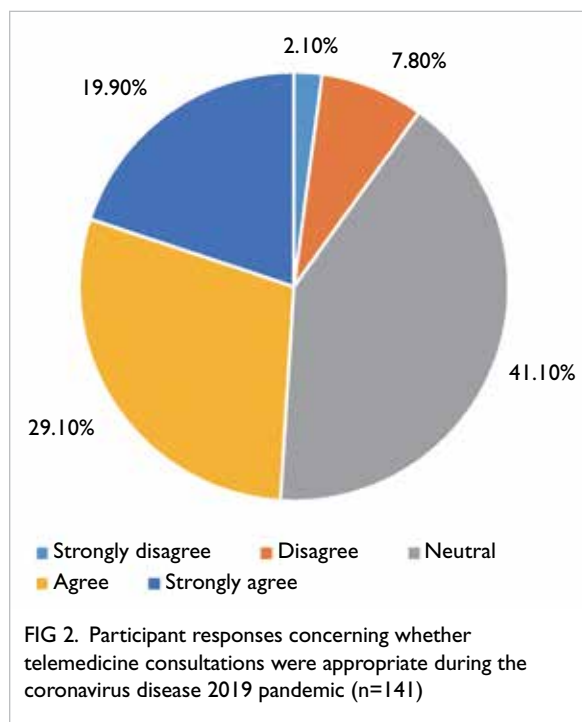
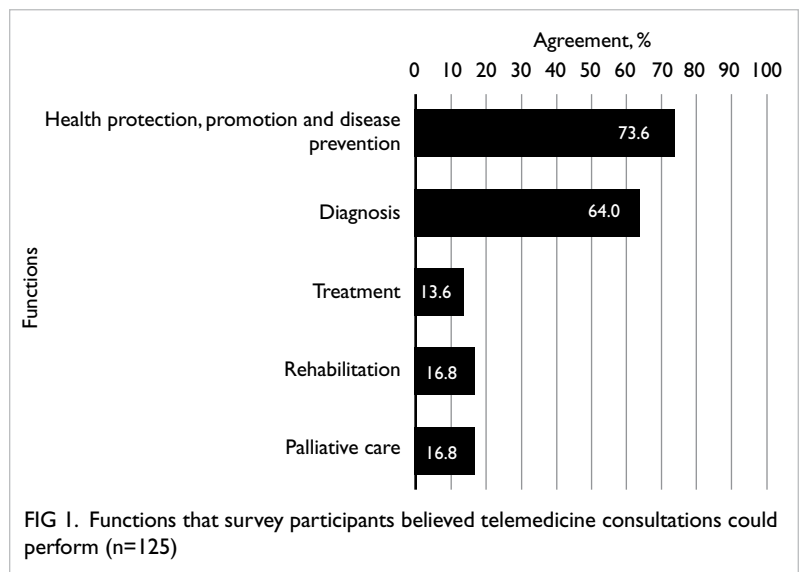
In total, 95.1% (116/122) participants believed that COVID-19 telemedicine consultations were useful. Most participants believed that telemedicine consultations could perform the functions of ‘health protection, promotion and disease prevention’ (73.6%) and ‘diagnosis’ (64.0%) [Fig 1]. Concerning the choice of telemedicine provider, almost all participants (99.2%) would accept medical doctors; more than half of the participants (54.1%) would accept trained nurses, but only 13.1% would accept non-clinical staff who had been trained to provide telemedicine services.

Nearly half of the participants (49.0%) agreed or strongly agreed that telemedicine consultations were appropriate during the COVID-19 pandemic (Fig 2). More than half (61.0%) of the participants reported satisfaction with telemedicine consultations (‘agree’ or ‘strongly agree’) and services provided by clinic staff (73.8% responded ‘agree’ or ‘strongly agree’). However, only 36.2% agreed or strongly agreed that service quality was identical between telemedicine consultations and in-person consultations.

Household capacity for potential coronavirus disease 2019–related quarantine

Household capacities for potential COVID-19–related quarantine were compared between telemedicine users in this study and respondents in the prior Hong Kong general public telephone survey²⁰ (Table 2). Telemedicine users reported having less space at home, fewer masks, fewer gloves, and less detergent for potential quarantine situations, compared with respondents in the Hong Kong general public telephone survey (all $P < 0.05$).

In response to the question ‘How many designated caregivers are appropriate for each isolated/quarantined person?’, telemedicine users were less likely to answer correctly (limit to one main carer, 8.1%), compared with respondents in the Hong Kong general public telephone survey (51.3%)²⁰ [$P < 0.001$, Chi squared with continuity correction].



Perceptions of coronavirus disease 2019 preparedness

Most telemedicine users (76.4%) believed that household prevention could prevent COVID-19; approximately 67% of them believed that they had sufficient knowledge to manage COVID-19–related health risks. These percentages were higher than the percentages in the Hong Kong general public telephone survey²⁰ (Table 3). Additionally, >80% of telemedicine users believed that Hong Kong had achieved better control of COVID-19, compared with other major cities.

TABLE 2. Household preventative measures for coronavirus disease 2019[†]

	Telemedicine users	Hong Kong general public survey ²⁰	P value
Have sufficient space for potential quarantine [‡]	n=138	n=764	0.002
No	68 (49.3%)	265 (34.7%)	
Yes	70 (50.7%)	499 (65.3%)	
Potential quarantine spaces are well-ventilated [§]	n=70	n=499	<0.001
No	10 (14.3%)	14 (2.8%)	
Yes	60 (85.7%)	485 (97.2%)	
Have sufficient masks to care for patients during quarantine [‡]	n=139	n=765	0.014
No	30 (21.6%)	101 (13.2%)	
Yes	109 (78.4%)	664 (86.8%)	
Have sufficient gloves to care for patients during quarantine [‡]	n=139	n=765	0.001
No	88 (63.3%)	368 (48.1%)	
Yes	51 (36.7%)	397 (51.9%)	
Have sufficient detergent to care for patients during quarantine [‡]	n=140	n=765	<0.001
No	30 (21.4%)	54 (7.1%)	
Yes	110 (78.6%)	711 (92.9%)	

* Data are shown as No. (%), unless otherwise specified

† The total number of respondents of the questions were different from the total samples of the two studies due to missing data

‡ Continuity correction

§ Only includes participants who reported sufficient space

|| Fisher's exact test

TABLE 3. Comparison of telemedicine users and the Hong Kong general public in terms of coronavirus disease 2019 (COVID-19)-related perceptions and communication channels[†]

	Telemedicine consultations users	Hong Kong general public survey ²⁰	P value
Household preparation can prevent COVID-19	n=140	n=765	0.044 [‡]
No	33 (23.6%)	249 (32.5%)	
Yes	107 (76.4%)	516 (67.5%)	
Sufficient knowledge to manage COVID-19-related health risks	n=139	n=765	<0.001 [‡]
No	46 (33.1%)	399 (52.2%)	
Yes	93 (66.9%)	366 (47.8%)	
Prevention is better in Hong Kong than in other cities	n=118	n=760	0.004 [‡]
No	22 (18.6%)	245 (32.2%)	
Yes	96 (81.4%)	515 (67.8%)	
Main channel for infectious disease information	n=137	n=763	0.001
Internet/mobile applications	88 (64.2%)	431 (56.5%)	
Television	33 (24.1%)	276 (36.2%)	
Personal sources (family, friends, or healthcare professionals)	9 (6.6%)	14 (1.8%)	
Others (eg, newspaper or radio)	7 (5.1%)	42 (5.5%)	
Preferred main channel for infectious disease information	n=135	n=762	<0.001
Internet/mobile applications	83 (61.5%)	411 (53.9%)	
Television	17 (12.6%)	260 (34.1%)	
Personal sources (family, friends, or healthcare professionals)	29 (21.5%)	17 (2.2%)	
Others (eg, newspaper or radio)	6 (4.4%)	74 (9.7%)	

* Data are shown as No. (%), unless otherwise specified

† The total number of respondents of the questions were different from the total sample of the two studies due to missing data

‡ P value of Chi squared test with continuity correction

Regarding their main channel for infectious disease information, approximately 64% of participants were using the internet or mobile applications, whereas 24% were using television; these percentages differed from the Hong Kong general public telephone survey, in which 56.5% of respondents used the internet or mobile applications and 36.2% used television²⁰ ($P < 0.001$). Overall, telemedicine users preferred their main channel for infectious disease information to be the internet or mobile applications and personal sources (eg, family, friends, or healthcare professionals).

Discussion

This study demonstrated high satisfaction with telemedicine consultations among users and revealed that users considered telemedicine to be appropriate during the COVID-19 pandemic. Despite the perception that telemedicine users have sufficient knowledge to manage health risks from COVID-19, when responses were compared between telemedicine users and the Hong Kong general public, we found that household preventative measures were inadequate among telemedicine users.

Acceptance of telemedicine

Most of our telemedicine users did not agree that quality was identical between telemedicine consultations and in-person consultations. This perspective possibly resulted from the provision of telemedicine consultations via telephone without a video component; moreover, the users might not have been familiar with the concept of telemedicine consultation. Indeed, a 2014 nationwide survey in the US revealed that only 15% of family physicians reported using telemedicine in the previous year; barriers included a lack of training, a lack of reimbursement, the cost of equipment, and potential liability issues.²¹ Furthermore, Schwamm²² has described telemedicine as a disruptive technology that may threaten traditional healthcare delivery. Obstacles to the expansion of telemedicine in the US include state-level statutes that require the clinician to be located in the same state as the patient and to have previously completed an in-person consultation with that patient.²³ Similar regulatory requirements exist in Hong Kong.²⁴

Various studies in the US have detected increasing uptake of telemedicine, particularly in primary care.²⁵⁻²⁹ A study of telemedicine users in a large commercially insured population in the US from 2005 to 2017 showed that the mean age was 38.3 years; on average, users of primary care telemedicine were younger than users of telemental healthcare and more likely to reside in urban areas.²⁵ A study regarding Teladoc, one of the largest

telemedicine providers in the US, revealed that Teladoc users were younger and less likely to have used healthcare before the introduction of Teladoc; they were also less likely to have a follow-up visit in any setting, compared with patients who visited a clinic for a similar condition.²⁶ These findings are consistent with our observations that most telemedicine users were young; they also suggest that the use of telemedicine services can provide opportunities for healthcare access that are not otherwise available.

Household preparations for coronavirus disease 2019

Intriguingly, although more telemedicine users agreed that household preparation could prevent COVID-19, they were less likely to believe that their household preventative measures were adequate, compared with respondents in the Hong Kong general public telephone survey.²⁰ This disparity may be attributed to differences in participant characteristics: telemedicine users in this study were younger (51% aged 18-24 years, vs 9% in the Hong Kong general public²⁰), were male (56% vs 47%²⁰), and were living in the New Territories (65% vs 51%²⁰). Telemedicine users were also more likely to use the internet (64% vs 57%²⁰) as the main channel for infectious disease information and to prefer using the internet for such information (62% vs 54%²⁰). These findings have important implications for the use of telemedicine to fill gaps in health promotion and disease prevention. Wu et al³⁰ found that secondary cases from household transmission of COVID-19 were common in Zhuhai, China, and one-third of these secondary cases were asymptomatic. Sufficient household preparation measures are needed to limit the spread of COVID-19.³¹

Future use of telemedicine in Hong Kong

Telemedicine in Hong Kong had a 'late start' (in 1994); in 1998, Hjelm³² predicted that the telemedicine would be rapidly implemented in Hong Kong. However, in the December 2019 version of the Ethical Guidelines on Practice of Telemedicine by the Medical Council of Hong Kong, it was noted that telemedicine in Hong Kong has not fully developed.²⁴ Despite the obvious convenience benefit and reduced risk of COVID-19 transmission, the guidelines remind practitioners that they remain fully responsible for legal and ethical obligations during telemedicine consultations.²⁴ Furthermore, the guidelines mention that standards of care to protect patients are applicable during in-person and telemedicine consultations; practitioners should familiarise themselves with the World Medical Association Statement on the Ethics of Telemedicine.³³

Training and patient assessment guidelines for healthcare practitioners are urgently needed, considering the unique circumstances surrounding the use of telemedicine, such as technology (eg, technical limitations of virtual consultations, including assessments), patient education and informed consent, cybersecurity, and other concerns.⁶ These guidelines would ensure that the same standards of telemedicine consultations can be implemented, as described by the Medical Council of Hong Kong.

Limitations

The present study focused on 141 telemedicine users of a single private clinic providing deep throat saliva polymerase chain reaction tests for detection of severe acute respiratory syndrome coronavirus 2; thus, the study participants may not be representative of all telemedicine users in Hong Kong. Responder bias may have affected the results (the response rate was 75.4%), but it was not possible to compare participants with individuals who refused to participate. Furthermore, the recent experience of a telemedicine consultation may have biased participants' responses in favour of telemedicine.

Concerning the comparison of COVID-19 risk perception and preparedness measures, methodological discrepancies between the online survey of telemedicine users and the telephone survey of the Hong Kong general public may have led to differences in responses, particularly with respect to including younger and more computer-literate individuals in the online survey. Although the present study was conducted from 6 April to 11 May 2020 (after a surge of COVID-19 cases in Hong Kong), the Hong Kong general public telephone survey used for comparison was conducted from 22 March to 1 April 2020 (during a surge in COVID-19 cases).²⁰ The difference in data collection periods may have contributed to different perceptions of COVID-19 preparedness. Various physical distancing measures were implemented during the COVID-19 surge (from late March to early April), which may also have contributed to differences between the telephone survey and online survey cohorts.

Finally, because of sample size limitations and problems with representativeness, the findings of the study may be restricted to understanding views regarding telemedicine consultations among participants in the present study. However, factors such as young age, residence in private housing, and residence in the New Territories may have contributed to response bias; because no information was collected concerning occupation, education level, income, or ethnicity, we could not control for bias related to these factors.

Conclusion

In this study, telemedicine users in Hong Kong agreed that telemedicine consultations were appropriate during the COVID-19 pandemic. Participants agreed that telemedicine consultations could perform the functions of health protection, promotion, disease prevention, and diagnosis. The use of telemedicine for screening and patient education can be encouraged during the COVID-19 pandemic in Hong Kong.

Author contributions

Concept or design: KKC Hung, EYY Chan, JCY Wu.
 Acquisition of data: KKC Hung, JCY Wu, CA Graham.
 Analysis or interpretation of data: KKC Hung, EYY Chan, ESK Lo, Z Huang.
 Drafting of the manuscript: All authors.
 Critical revision of the manuscript for important intellectual content: KKC Hung.

All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

All authors have disclosed no conflicts of interest.

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Ethics approval

This research was approved by the Survey and Behavioural Research Ethics Committee of The Chinese University of Hong Kong (Ref No.: SBRE-19-730). Patients were treated in accordance with the tenets of the Declaration of Helsinki and provided written informed consent for all treatments and procedures, as well as publication of their anonymised data.

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