Efficacy And Feasibility of Telephone-Delivered Educational Intervention in Knowledge Transfer of COVID-19 Related Information to Elderly in Hong Kong: A Pilot Study

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Research

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Abstract

Background

Educational interventions were necessary to clarify COVID-19 related misconceptions among Hong Kong older adults. Yet, face-to-face interventions were infeasible under the pandemic. The primary objective of the present study was to evaluate the efficacy of a healthcare student-led, telephone-delivered intervention in educating older adults on COVID-19 related health topics. Feasibility, satisfaction level in subjects and impacts on volunteer students of the intervention were also explored.

Methods

Subjects aged 65 or above were recruited from a community center in Yuen Long, Hong Kong. The telephone-delivered intervention consisted of 5 phone call sessions conducted by student volunteers. The first four sessions included pre-tests covering three COVID-19 related health topics. Standardized explanations were offered to all subjects during phone call. In the last session, post-tests on all themes were conducted. Paired t-test and McNemar's test were used to measure the efficacy of intervention based on the differences in pre-tests and post-tests scores. The level of significance was 0.05. Subject satisfaction surveys and student feedback surveys were analyzed. This was a longitudinal study with no control group.

Results

Twenty-five subjects were recruited. Paired t-test results showed statistically significant improvement in test scores for all themes: from 76.0% to 95.3% ($p < 0.01$) on Medication Safety, from 64.0% to 88.9% ($p < 0.01$) on Healthcare Voucher, and from 78.0% to 93.0% ($p < 0.01$) on COVID-19 Myth busting. McNemar's test results showed an increase in correct rate for all questions. However, the improvement was not statistically significant in 65% of the questions due to small sample size and ceiling effect. Most subjects were satisfied with the program and improvement in mood after the program were reported. Student feedback survey suggested that the intervention enhanced students' communication skills and understanding about older adults in Hong Kong.

Conclusion

Our pilot study offered initial evidence to suggest the efficacy and feasibility of telephone-delivered educational intervention in educating Hong Kong older adults and its benefits on student volunteers. Future studies should include a larger sample size and evaluate the ability of phone calls in improving subjects' mental well-being.

Key Messages Regarding Feasibility

- It was uncertain whether phone calls are feasible, effective and well-accepted in educating elderly subjects concerning COVID-19 related health information.

- Our pilot study offered initial evidence to suggest the efficacy and feasibility of telephone-delivered educational intervention in educating Hong Kong older adults and its benefits on student volunteers.
- Future studies should include a larger sample size and evaluate the ability of phone calls in improving subjects' mental well-being.

Introduction

Background

Since early January, the outbreak of COVID-19 affected multiple aspects of Hong Kong society tremendously, such as the tourism and retail industry. While COVID-19 itself can be deadly and fatal, the spread of misinformation amid the pandemic should not be overlooked. As the World Health Organization stated, the spread of false information such as fake remedies and conspiracy theories has hampered efforts to fight against COVID-19 [1].

In particular, a recent study revealed that older adults aged 65 or above were more likely to hold COVID-19 related conspiracy beliefs than younger age groups [2]. In fact, it was suggested that older age groups were usually more susceptible to health misinformation due to memory and cognitive decline as a result of ageing [3]. For instance, a 2016 study found that users over 65 years old shared seven times as many fake news articles as the youngest age group [4]. It was also found that health literacy was generally lower in older age groups [5, 6], especially those with lower educational and socioeconomical levels [5, 6]. Apart from low educational level, the popularization of social media also contributed to the spread of COVID-19 related health misinformation [7]. Further, social distancing led to the stop of social welfare services in Hong Kong, making it more difficult for old adults to seek advice from healthcare professionals [8], rendering them more reliant on inaccurate online information.

In Hong Kong, the well-being of older adults was negatively affected by the spread of COVID-19 related misinformation. Without proper understanding of COVID-19, old adults were unable to protect themselves correctly, thus increasing their susceptibility to the disease. For example, some older adults believed that face masks could be reused after washing with detergent [9]. Second, older adults might panic and become anxious after listening to exaggerated rumors [10]. In fact, frequent exposure to misinformation and conspiracy theories was associated with higher risk of depression during the COVID-19 pandemic [11]. Hence, it is possible that COVID-19 misinformation could negatively affect the well-being of older adults in Hong Kong.

Given the potential impacts of COVID-19 related misconceptions on older adults, educational interventions are of paramount importance to clarify these misunderstandings. Apart from educational purposes, such interventions are important in providing elderly with a supporting net to improve their psychological well-being amid the pandemic. Previous systematic reviews suggested that face-to-face educational programs such as seminars and Q&A sessions were effective in improving health literacy among older adults [12, 13]. Yet, under social distancing policies, it is difficult to organize large-scale and

face-to-face health educational programs. Therefore, virtual educational programs through mobile applications, telephone calls, internet, etc., seemed more feasible.

Among the various types of virtual intervention programs, telephone-delivered interventions appeared to be more appropriate under the pandemic because it was difficult to educate older adults on the use of mobile and web-based applications without any prior face-to-face instruction classes. Moreover, the use of mobile applications was not popular among Hong Kong elderly population given that only 57% of elderly owned a smart phone in 2019 [14]. In contrast, telephone is easier to use and more popular among elderly population, suggesting that telephone-delivered educational interventions more practical and suitable.

Previous studies suggested the effectiveness of telephone-delivered educational interventions in multiple health-related issues such as smoking cessation [15] and diabetes management [16]. Yet, studies focusing on COVID-19 related health issues were limited. Previous programs were commonly conducted by healthcare professionals while our present intervention was run by healthcare students from various healthcare disciplines, which enabled interprofessional collaboration among students. Therefore, the present study proposed a student-led, telephone-delivered program to educate older adults in Hong Kong.

The primary objective of this pilot study was to evaluate the efficacy of a university student-led, telephone-delivered intervention in educating Hong Kong older adults on COVID-19 related health knowledge. The secondary objectives were to evaluate the feasibility and satisfaction level of the telephone-delivered intervention within subjects and to evaluate the impacts of a telephone-delivered intervention on the student volunteers.

Methods

Study design

The study was a longitudinal pilot study which compared subjects' knowledge level concerning COVID-19 before and after the 5-week intervention. Pre-tests and post-tests based on COVID-19 related topics including medication safety, healthcare voucher, and COVID myth debunking were carried out to reflect the effectiveness of educational interventions. No control group was involved in this study.

Subjects

Twenty-five older adults aged 65 or above were recruited from a local elderly district community centre in Hong Kong. Participants aged 65 years old or above, able to communicate in Cantonese and able to communicate in mobile phones for subsequent telephone-delivered interventions were recruited. Participants were excluded if they were cognitive or hearing impaired. Participants who failed to attend all five sessions of the intervention and evaluation were also excluded in data analysis.

Materials

1. COVID-19 related knowledge questionnaires

A pre-test and post-test questionnaires were designed to evaluate the knowledge level relating to COVID-19 of subjects. The pre-test questionnaire included a total of 20 True or False questions. The pre-test questionnaire was composed of three themes where each theme focused on one COVID-19 related health topic. The questions in the post-test questionnaire were all the same as the pre-test questionnaire. The difference in scores between pre-test and post-test questionnaires was taken to reflect the efficacy of the intervention. The three health topics were specifically included in the knowledge questionnaires to better cater for the health needs of older adults in Hong Kong.

Theme 1 included 5 questions and focused on medication safety. Under the COVID-19 pandemic, non-essential healthcare services at public hospitals were reduced. As follow-up appointments were postponed, some chronic patients might experience shortage of medications. Instead of consulting healthcare professionals, some of them might discontinue their medications [17]. Hence, medication safety education is of paramount importance to ensure drug adherence amid the pandemic.

Theme 2 included 5 questions and focused on Healthcare Vouchers. To subsidize older adults in Hong Kong to use private healthcare services, qualified older adults are currently provided with HKD \$2000 worth of health care vouchers by the government. Although these vouchers aimed to subsidize private healthcare services only, some older adults might wrongly believe that these vouchers could be used to purchase sanitizing products and facemasks. Further, scams and disputes related to health care vouchers occurred occasionally during the pandemic [18]. It was therefore important to educate subjects on health care voucher to better protect their rights.

Although questions in themes 1 and 2 were not directly about COVID-19, they were included since related health issues may arise during the pandemic as mentioned. As current health advertisements focused primarily on COVID-19, educating subjects on other important health issues became necessary.

Theme 3 included 10 questions focusing on COVID-19 myths debunking. As said, COVID-19 related fake news and misinformation were extremely prevalent. Some older adults might find it difficult to differentiate between right and wrong health information.

2. Subjects' feedback survey

By the end of the 5-week program, every subject was invited to complete a feedback survey comprised of a few yes-no questions and open-ended questions. The feedback survey aimed to investigate subjects' opinions and overall satisfaction level towards the intervention program. Feedbacks and satisfaction level of subjects were crucial in evaluating the feasibility of the intervention.

3. Students' feedback survey

Likewise, to evaluate the impacts of the intervention on involved students, student volunteers were invited to fill in a survey consisted of 8 open-ended questions regarding the most and least enjoyable parts of the

program, major challenges encountered, new skills acquired and preferred mode of service learning (phone-delivered versus face-to-face).

4. Focus group interview with students

Apart from students' feedback survey, a focus group interview was conducted after the program to better understand students' perceptions of interprofessional collaboration during the intervention. A total of 21 students, divided into 7 groups with 3 students in each group, were interviewed. Each interview lasted for 45 minutes.

5. Geriatric Depression Scale (GDS-15) survey

To evaluate depression risks of subjects during COVID-19, the Chinese version of the Geriatric Depression Scale (GDS-15) was adopted [19]. The questionnaire included 15 questions as a self-report assessment used to evaluate depression risks in subjects. The total score of the GDS-15 survey was 15 marks. A total mark of 5 or above indicates low to moderate risk of depression while 8 marks or above indicates high risk of depression.

Intervention and experimental procedure

The study was designed and carried out by undergraduate students in health disciplines (Medicine, Nursing, Nutritional Science, etc.) under supervision of two registered pharmacists in Hong Kong. Oral consent from study subjects and students were attained prior to the start of intervention. Each subject participant was paired up with one student during the intervention. The student was also required to write a phone call summary after each intervention session. The overall logistic flow of the study was summarized in Table 1.

Table 1
Overview Logistic Plan

Time	Tasks
Before week 1	<ul style="list-style-type: none"> ● Training session on intervention protocol and communication techniques
Week 1	<ul style="list-style-type: none"> ● Self-introduction ● GDS-15 survey ● Pre-test and explanations on theme 1: Medication safety
Week 2	<ul style="list-style-type: none"> ● Pre-test and explanations on theme 2: Health Care Voucher
Week 3	<ul style="list-style-type: none"> ● Pre-test and explanations on theme 3: COVID-19 myths debunking (First 5 questions)
Week 4	<ul style="list-style-type: none"> ● Pre-test and explanations on theme 3: COVID-19 myths debunking (Later 5 questions)
Week 5	<ul style="list-style-type: none"> ● Posttest on theme 1, 2, and 3 ● Subject feedback survey
After Week 5	<ul style="list-style-type: none"> ● Student feedback survey

During week 1, students first introduced themselves and provided the subject with an overview of the telephone-delivered educational program. Subjects were also asked to provide their preferred time to conduct phone calls. Also, the GDS-15 survey was done to determine the mental wellbeing of subjects.

During week 1 to 4, pre-test questionnaire of the three aforementioned health topics were conducted at the start of each phone call session to measure subjects' health knowledge level before any interventions. All the True or False questions were asked verbally via phone by students. Answers of the subjects were then marked down by students. 1 mark will be awarded if the subject answered correctly and was able to justify his answers correctly. Marks will not be awarded for wrong answers or answers without reasonable justifications. The total scores for pre-test and post-test questionnaire were 20 marks.

As part of our intervention, the student would provide the subject with correct answers and standardized explanations after completing the pre-test questionnaire. The subject was also invited to raise other health-related questions which were then answered by the student during the phone call. Each phone call was expected to last for 10 minutes on average.

Several measures were taken to reduce variability between interventions delivered by different students. First, students were provided with standardized answers for the questionnaires. Further, prior to the program, students were required to attend training sessions organized by pharmacists and social workers, where the intervention protocol and tips for improving communication with older adults were introduced. To ensure fairness, students were also told not to offer any hints when conducting the pre-test

and post-test. Further, students should only contact the subject during the five scheduled intervention sessions.

Post-test questionnaire comprised of 20 questions covering all three health themes was done in week 5. Unlike the pre-test questionnaire, correct answers and explanations would not be given if the subject answered incorrectly because the post-test questionnaire aimed to evaluate the efficacy of program and was not part of the intervention.

Study population

Twenty-five subjects were recruited from community centers in the pilot scheme. Each subject was paired up with a student. Background information including education level, gender and age of subjects were also collected.

Data processing and statistical analysis

The primary outcome was the differences in questionnaire scores between pre-test and post-test. Differences between pre-test and post-test scores measured the effectiveness of the intervention. The mean, standard deviation and range of tests scores were considered.

Paired t-test was used to evaluate the efficacy of intervention based on the differences in pre-test and post-test mean scores of the three topics. McNemar's test was used to evaluate the efficacy of intervention based on the differences in proportion of subjects answering each question in questionnaires correctly. The level of significance was set at 0.05.

The secondary outcome was the feasibility and satisfaction level of intervention among subjects and the impact of intervention on students. Descriptive statistics was run to analyze results from yes-no questions while qualitative analysis was done for open-ended questions. Data collected were then recorded in Microsoft Excel. SPSS was used for statistical analysis.

Results

A total of 25 participants were recruited at the aforementioned community center. Phone calls were made between October and November in 2020. All the subjects completed the study and their sociodemographic characteristics at baseline were summarized in Table 2.

Table 2
Sociodemographic characteristics of Elderly Subjects at baseline

Mean age (years old)	71.7±4.8
Gender	
Male	9 (36.0%)
Female	16 (64.0%)
Educational Qualifications	
Have received primary education or above	25 (100.0%)
Have received secondary education or above	14 (56.0%)
Physical Health	
With chronic diseases	15 (60.0%)
Hypertension	7 (28.0%)
Hypercholesterolemia	3 (12.0%)
Diabetes	2 (8.0%)
Other chronic diseases	3 (12.0%)
Without any chronic diseases	10 (40.0%)
GDS-15 Survey	
Mean GDS-15 Score	3.84
Below 5 marks (No risk of depression)	16 (64.0%)
5 marks or above (Low to moderate risk of depression)	9 (36.0%)
Average phone call duration (minutes)	23.7±14.6

Content of phone call conversation

Apart from performing knowledge questionnaires and addressing health-related issues, 24 subjects (96%) actively shared about their personal lives based on phone call summary. In the first phone call, around 5 subjects (20%) expressed their worries and concerns regarding insufficient facemasks supplies, social isolation, personal medical conditions etc.

Efficacy of telephone-delivered intervention

The average total questionnaire scores increased from 74.0 ±15.0 % to 92.5±8.43 % ($p<0.01$) after the intervention and the percentage improvement was +25.5±5.97 %. Paired-t test results showed statistically significant improvement on questionnaire scores in all three themes: from 76.0±30.5 % to 95.3±8.72 %

($p < 0.01$) on Medication Safety, from $64.0 \pm 31.6\%$ to $88.9 \pm 20.1\%$ ($p < 0.01$) on Health Care Voucher, and from $78.0 \pm 15.4\%$ to $93.0 \pm 8.52\%$ ($p < 0.01$) on COVID-19 myth debunking.

Of note, age of subjects was negatively and moderately correlated with the percentage increase in test scores ($p = 0.03$, $R = -0.428$). Other sociodemographic characters including gender, educational level, health conditions and GDS value were not associated with the efficacy of intervention as shown in Table 3 ($p > 0.05$).

Table 3
Association between efficacy of intervention and sociodemographic characters

Sociodemographic variables	Pearson's Coefficient (R)	p -value
Gender (male and female)	N/A	0.556
Educational level (primary and secondary or above)	N/A	0.110
GDS-value	0.216	0.300
Age	-0.428	0.0330

McNemear's test showed an increase in correct rate for all the questionnaire questions following intervention except for question 17 where all subjects answered correctly in both pre-test and post-test. The mean proportion of correct response increased from $72.4 \pm 17.6\%$ to $92.2 \pm 10.1\%$ following the intervention. All subjects answered correctly in post-test questionnaire for 8 of the 20 questions (40%). However, the improvement in correct rate were not statistically significant for 13 questions (65%) due to small sample size and ceiling effect because the correct rate for most of these 13 questions in pre-test were already very high ($>80\%$). The McNemar's test results for individual question were summarized in Table 4.

Table 4
Summary of Knowledge Survey Results

Question (Answer)	Correct rate in pre-test (%)	Correct rate in post-test (%)	p-value
Theme 1 (Medication Safety)			
Q1: It is appropriate to stop a course of antibiotics early when symptoms disappear (False)	68	100	0.031
Q2: If you find it difficult to swallow tablets, it is appropriate to crush it. (False)	56	72	0.289
Q3: When medications prescribed by the doctor failed to manage your conditions well, you should take additional herbal or Chinese medications to alleviate your symptoms (False)	72	96	0.031
Q4: It is unnecessary to consult your doctor or pharmacist if you experience any side effects such as vomiting and headaches after taking prescribed medications (False)	88	100	0.250
Q5: In case of drug shortage during the pandemic, it is harmless to borrow drugs with similar therapeutic effects from your neighbors.	88	100	0.250
Theme 2 (Health Care Voucher)			
Q1: The accumulation limit of the health care voucher is HKD \$5000. (False)	76	88	0.453
Q2: Health care vouchers can be used to purchase facemasks at pharmacy. (False)	52	96	0.003
Q3: Health care vouchers can be used to pay for COVID-19 testing fee at private hospitals. (True)	40	84	0.007
Q4: Health care vouchers can be used to purchase medications at pharmacy. (False)	72	92	0.125

Question (Answer)	Correct rate in pre-test (%)	Correct rate in post-test (%)	p-value
Q5: Health care vouchers can be used for payment of accommodation fee at public hospitals. (False)	64	84	0.125
Theme 3 (COVID-19 myth debunking)			
Q1: Face masks can be worn inside out. (False)	92	100	0.5000
Q2: COVID-19 is airborne. (False)	32	64	0.039
Q3: COVID-19 can be prevented and treated by antibiotics. (False)	84	96	0.375
Q4: COVID-19 can be prevented by pneumococcal vaccine. (False)	80	88	0.687
Q5: Medical masks easily accessible at pharmacy are protective enough against COVID-19. (True)	68	88	0.125
Q6: Face masks can be sterilized and reused after heating. (False)	88	100	0.250
Q7: One should wash their hands after removing one's masks. (True)	100	100	N.A
Q8: All health information on social media platforms is accurate. (False)	76	100	0.031
Q9: Only elderly but not younger adults are at risk of getting COVID-19. (False)	88	100	0.250
Q10: Surgical masks should not be worn more than 8 hours. (True)	64	96	0.021

Feasibility and satisfaction level of telephone-delivered intervention

Overall, subjects were highly satisfied with various aspects of the intervention program. Our satisfaction survey showed that almost all subjects agreed that the duration of phone calls (96%) and difficulty of questions were appropriate (88%). Only three subjects (12%) found the questions too easy. Further, many subjects agreed that this program was useful and greatly enhanced their understanding about COVID-19 (96%). Apart from knowledge enhancement, a number of subjects agreed that they felt cared for and became more hopeful after the program (92%):

'It's nice that I got to talk to young people via this program' [6]

'I felt happier and learnt a lot after the program' [13]

'It's nice and heartwarming that I got to talk to the same person during every phone call session' [17]

Although telephone-delivered approach reduced face-to-face interactions, all subjects agreed that telephone-based interventions were flexible and convenient (100%). In fact, 18 subjects (72%) preferred telephone-based over face-to-face programs because phone calls were more convenient and personalized. A few subjects (28%) preferred face-to-face programs because it offered more authentic and genuine interactions.

When asked about the shortcomings of the program, around 4 (16%) of them hoped that face-to-face seminars could be incorporated into the intervention while another 3 (12%) hoped that they could be notified of the phone call schedule earlier such that they could better arrange their plans. The remaining 17 (72%) did not think that the program had any significant deficiencies.

Impacts of telephone-delivered intervention on students

A total of 25 student volunteers were recruited and all of them completed the program. Their demographic characteristics at baseline were summarized in Table 5. Overall, students commented positively on the intervention. Students' feedback surveys showed that 14 students (56%) enjoyed the flexibility of the program. Other students found the program meaningful (16%) and the duration of program appropriate (32%). Only 2 students (8%) did not find any parts of the program enjoyable.

Table 5
Demographic characteristics of student volunteers

Prior experiences in telephone-based volunteering	
Yes	10 (40.0%)
No	15 (60.0%)
Gender	
Male	6 (24%)
Female	19 (76%)
Academic Profile	
Mean year of study	2.36±0.6
Year 2	17 (68.0%)
Year 3	7 (28.0%)
Year 4	1 (4.0%)
Majors	
Biomedical Sciences	2 (8.0%)
Medicine	9 (36.0%)
Pharmacy	7 (28.0%)
Public Health	3 (12.0%)
Food and Nutritional Science	1 (4.0%)
Nursing	3 (12.0%)

Most students also believed that they were able to apply skills taught at class in the program. 12 students (48%) believed that they were able to apply medical knowledge taught at class. Another 4 students (16%) mentioned other skills such as communication skills and bioethics knowledge. The remaining 11 students (44%) did not think that they were able to apply any skills acquired at school during the program.

Regarding major obstacles encountered during phone call sessions, a number of them (46%) found it difficult to communicate with subjects via phone calls solely. Another 5 students (20%) had difficulties in contacting subjects while 3 students (12%) found it difficult to sustain conversations with subject. Around 5 students (20%) did not encounter any difficulties throughout the program.

When asked about the major benefits of program, 23 students (92%) believed that their communication skills improved significantly. While it was previously mentioned that students found it difficult to bond with subjects under the absence of face-to-face interactions, many believed that they became more

sensitive and cautious about verbal cues. Also, 19 students (76%) believed the program deepened their understanding about older adults in Hong Kong as they realized older adults were more knowledgeable than expected.

Despite the benefits associated with the program, only 7 students (28%) preferred telephone-based while 17 (68%) liked face-to-face interventions more. The remaining 1 student did not have any strong preferences.

Students' perceptions of interprofessional collaboration

During the focus group interview, all students agreed that interprofessional collaboration played an important role in providing subjects with quality content. For example, one student pointed out that he could turn to other pharmacy students for help when the subject asked him questions related to medications.

Apart from collaboration between healthcare students, most student helpers agreed that (92%) collaboration between healthcare and non-healthcare students should be promoted when conducting similar interventions in the future. For example, some students pointed out that students majoring in education might offer insights in better ways to interact and educate subjects. The remaining two students (8%) disagreed, claiming that non-healthcare students might not be sufficiently capable to educate subjects on health-related issues.

Discussion

Efficacy of intervention

Our findings suggested that telephone-delivered educational intervention was effective in knowledge transfer as the improvement in test scores were statistically significant. A similar pilot study found that telephone-delivered educational intervention was effective in improving knowledge of older adults during the Hong Kong SARS epidemic in 2007 [20]. In contrast to the present study, only two phone calls, instead of five, were conducted in the previously mentioned study to avoid information overloading. Nonetheless, our findings suggested that increasing the quantity of content delivered did not reduce intervention efficacy.

Multiple factors might have contributed to the high efficacy of intervention. First, the educational contents delivered in the program was easy to understand as most subjects deemed the difficulty level appropriate. Second, the educational program was personalized and able to address different questions raised by individual subject because our phone calls were made on a one-on-one basis.

However, our current findings might not be applicable to other population groups. A meta-analysis published in 2014 analyzed 5 randomized controlled trials and concluded that phone call interventions were not more effective than standard care in glycemic control of diabetes patients [21]. This occurred because the included studies were mostly conducted in rural areas where diabetic patients typically had

lower economic and education level, leading to poorer medication adherence [21, 22]. Given that, high efficacy of intervention was found in the present study potentially because Hong Kong was a well-developed city and that all our subjects received at least primary education.

Nonetheless, this does not imply that phone call interventions were not useful in rural areas. Rather, phone-based interventions are particularly useful in remote areas because health education in these regions are limited [23]. Also, intervention content should be adjusted based on subjects' education and knowledge level to maximize efficacy.

Of note, it was found that age was negatively correlated with the efficacy of intervention. This finding was consistent previous studies as information retention was generally lower in older people [24]. Further, multiple studies suggested that age was negatively correlated with knowledge level concerning COVID-19 and older adults at large had inadequate knowledge about COVID-19 [25]. Also, elderly of younger age were more likely to engage in social activities and interact with other individuals [26], resulting in increased exposure to COVID-19 related knowledge [27].

Despite improvement in correct response rate for all questions (except for Q7), not all of them were statistically significant. For one, the correct response rate in some of the pre-test questions were already very high (>80%). Thus, even if all subjects answered correctly in the post-test, improvements would remain statistically insignificant due to insufficient statistical power.

Yet, for pre-test questions with poorer performance (<80%), those with greater relevance to COVID-19 were more likely to show significant improvement in correct response rate. For instance, question 2 and 3 were related to the use of healthcare vouchers in COVID-19 related services like COVID-19 testing and showed significant improvement in correct response rate. Likewise, questions in topic 3 were related to COVID-19 myth busting and almost all of their correct response rate increased significantly. Conversely, other questions in theme 2 (Q1, 4, 5) were related to the general guidelines of healthcare vouchers and their correct response rate did not improve significantly.

Under extensive media coverage and public health promotion, people's knowledge towards COVID-19 generally improved as the pandemic continued [28, 29] regardless of the intervention. Current study results suggested that such improvement was further enhanced by the intervention. Meanwhile, subjects appeared to be less well informed about other health topics these topics were generally less heavily emphasized in health promotion programs during the pandemic, indicating that these health issues should not be overlooked in future interventions.

Satisfaction level of subjects

Furthermore, subjects were highly satisfied with the phone-based intervention due to its usefulness and ability to improve their mood. Due to social distancing policies, many older adults felt isolated [30] and GDS survey suggested that around one-third of subjects were at risk of developing depression. Meanwhile, results of the subject satisfaction survey showed that many of them felt cared for and became more positive after the program. Although our subjects did not undergo any rigorous training in

communication, our results suggested that phone-based interventions had the potential to improve subjects' psychological well-being during the pandemic. A similar study conducted recently also showed that lay-person delivered phone calls were able to reduce loneliness and depression within subjects during the pandemic [31].

Impacts on students

Apart from its positive impacts on subjects, the telephone-based intervention also benefitted the students. First, students were able to practice their phone-based communication skills and the use of verbal cues. While face-to-face patient communication was heavily emphasized in health-related disciplines, phone-based communication skills were equally important in scenarios such as patient referral, telephone consultation services and breaking bad news [32, 33]. Telephone communication skills acquired through the present study were of paramount importance for health-related students in future practice.

Second, the program improved students' understanding about elderly people in Hong Kong. Students realized that older adults in Hong Kong were more knowledgeable than expected. Although students' attitudes towards older adults were not formally accessed in the present study, misconceptions and negative prejudices against older people remained prevalent in health professionals and students of health-related disciplines [34]. When students with negative attitudes towards elderly became health professionals, they were more likely to offer poor patient care [35]. Meanwhile, students in the present study found that older adults were more knowledgeable than expected, suggesting that their perceptions on older adults became more positive. This suggested that elderly related volunteering work had the potential to improve students' attitudes towards older adults.

Moreover, interdisciplinary collaboration between students benefitted both students and subjects in the program. For one, students were able to learn from each other and share their expertise. During the design of COVID-19 knowledge questionnaires, healthcare students from different majors were responsible for setting different questions. For instance, pharmacy and public health students helped to design questions for 'Medication Safety' and 'Healthcare Vouchers' respectively. Also, the questionnaires were cross-checked by students before the program.

Also, interprofessional engagement benefitted the subjects by improving the quality of intervention delivered. For example, when public health students were asked about medication problems by subjects during phone calls, other pharmacy students were able to assist. Our results suggested that interprofessional collaboration ensured information accuracy during phone calls and were in line with previous studies [36, 37].

Implications: Telehealth in Hong Kong

Given the high efficacy and satisfaction level of intervention, the present study offered preliminary evidence about the feasibility of telehealth implementation in Hong Kong. Telehealth refers to the provision of health services remotely via digital communication tools such as phone calls, video conferencing and short messaging services (SMS) [38]. Under the pandemic, many medical

appointments and patient education seminars were canceled while telehealth had the potential to address this issue. While studies in USA [39] and Canada [40] showed that telehealth was feasible and able to supplement traditional care, studies in Hong Kong were lacking. Hence, the present study suggested that phone calls were well accepted by elderly subjects in delivering health education.

However, the intervention still had room for improvement. First, video-conferencing could be incorporated in future interventions. Satisfaction survey suggested that some subjects who felt socially isolated hoped that face-to-face interventions could be incorporated for more genuine and natural interactions. However, face-to-face activities were unlikely due to social distancing policies. Hence, videoconferencing could be a feasible substitution to enhance authenticity of communication and wellbeing of elderly in Hong Kong [41] without increasing the risk of COVID-19 infection. Also, it was previously found that video-conferencing was well accepted within Hong Kong elderly populations [42].

Apart from videoconferencing, SMS might also be useful in future interventions and telehealth services. As reported in feedback surveys, some students were unable to contact the subjects while some subjects were unable to answer the call as scheduled because they were busy with other activities. To address this issue, SMS could be useful as subjects could read the messages based on their schedules. Although educators and subjects were unable to have real-time interactions through SMS, previous systematic reviews suggested that SMS-based interventions were able to improve clinical outcomes in diabetes patients thanks to the personalized nature of SMS [43, 44]. For instance, subjects involved in these interventions were often provided with tailored dietary and lifestyle advice based on individual blood glucose level, medical history, insulin dose, etc. Hence, SMS might be able to offer health information regularly and future studies should investigate the efficacy of various forms of telehealth tools.

Limitations

There are several limitations in the current study. This study was unable to measure the effect size due to small sample size and a lack of control group. However, inclusion of control group remained difficult as community centers typically hope that all of their subjects are able to receive interventions.

Also, improvement in subjects' knowledge level might not be long-lasting owing to the short study period. Further, since the pre-test and post-test questions were identical, the improvement in questionnaire scores might be inflated.

Moreover, sample size was low, and subjects were not recruited in a random basis but from one district community center only. For instance, around 56% of subjects received secondary education, compared to the Hong Kong elderly average of 39.6% [45]. Therefore, our findings might not be applicable to other older adults in Hong Kong. To address this issue, the investigators has launched a similar yet larger-scale program with a sample size of 300. This ongoing study may offer insights into its feasibility and impacts when carried out with more participants.

Finally, no pre- and post-questionnaires were done to measure the impacts of interventions on subjects' depression level and mood. Future studies should include relevant surveys to quantify the impacts of interventions on subjects' mental well-being.

Conclusion

In conclusion, our pilot study offered initial evidence to suggest the efficacy and feasibility of telephone-based interventions in educating Hong Kong elderly on COVID-19 related information. Also, our study suggested that the intervention improved student volunteers' communication skills and understandings about elderly in Hong Kong.

Declarations

Ethics approval

The current study was approved by the Survey and Behavioural Research Ethics Committee at the Chinese University of Hong Kong (Reference number: SBRE-20-048). All subjects had provided their informed consent before enrolment.

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The study did not receive any financial funding.

Conflict of interests

The authors declare that they have no competing interests.

Data availability statement

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Authors' contribution

Mong Yung Fung, Yu Hong Lee, Yan Tung Astor Lee and Mei Ling Wong, designed the intervention. Mong Yung Fung and Yu Hong Lee analyzed the data. Mong Yung Fung, Yu Hong Lee, Yan Tung Astor Lee and Mei Ling Wong wrote the paper. Joyce Tik Sze Li and Vivian Wing Yan Lee supervised the study and critically reviewed the manuscript. Enoch E Nok Ng recruited subjects and arranged the logistics of the study.

All authors have approved the manuscript for submission. The content of manuscript has not been published, or submitted for publication elsewhere. The authors declare no conflicts of interest.

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