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# Pharmacists' Perspectives on the Use of Telepharmacy in Response to COVID-19 Pandemic in Ho Chi Minh City, Vietnam

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## Abstract

**Introduction:** Telepharmacy, the application of information and communication technologies in healthcare services, has been adopted in many countries to provide patients with pharmaceutical care. However, it has yet to be widely used in Vietnam. This study was conducted to assess the current status of use and the factors associated with the willingness to use telepharmacy of pharmacists in Vietnam. **Methods:** A descriptive cross-sectional study was conducted from February to July 2021; 414 pharmacists were recruited to fill in an online survey. **Results:** Overall, 86.7% of participants have used telepharmacy application and 87.2% of them were willing to apply telepharmacy in pharmacy practice. According to our multivariate analysis, the level of readiness was associated with positive attitude (odds ratio [OR] = 4.67; 95% confidence interval [CI]: 2.26-9.66), and a good behavior (OR = 11.34; 95% CI: 3.84-33.45). **Discussion:** Developing a telepharmacy system with appropriate features is essential to meet the requirements of pharmacy practice amid the spread of the COVID-19 pandemic.

## Keywords

COVID-19, pharmacist, pandemic, telepharmacy, Vietnam.

## Introduction

Telepharmacy is the delivery of pharmaceutical care by pharmacists via the use of information and communication technologies (ICTs) to patients at a distance.[1] Telepharmacy is particularly useful in assisting healthcare facilities to perform pharmacy operations in the absence of pharmacists or when pharmacy resources are limited.[2] According to the 2018 Health statistics yearbook of the Vietnamese Ministry of Health, the number of pharmacists per 1,000 inhabitants was 0.29 in Vietnam and was 0.06 in Ho Chi Minh City (HCMC). The application of telepharmacy is therefore potential in Vietnam given its limit of health care resources. Evidence exists in different contexts regarding the effectiveness of telepharmacy. For example, in northwest Queensland, thanks to telepharmacy, the Mount Isa Base Hospital was able to interact with patients and provide clinical care to remote areas where there were no available on-site pharmacists.[3] In addition, a meta-analysis of 21 articles from 2010 to 2020 has shown that telepharmacy has the potential to enhance pharmacy services in oncology care,

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including follow-up monitoring and counseling, intravenous chemotherapy and sterile compounding, expanding the availability of pharmacy services, and remote education.[4] Telepharmacy has been adopted in many parts of the world since 2001, especially in North America (the United States, Canada),[5-8] Europe (Spain),[9,10] and Oceania (Australia).[11] A study in all 7 states of the United Arab Emirates reported that telepharmacy has been used to provide pharmaceutical care to 19,974 patients over 4 months, which was 2 times higher than the number of patients cared by pharmacies that did not use this service. Notably, the rates of medication dispensing errors, prescription-related errors, and pharmacist counseling errors were significantly lower in pharmacies with telepharmacy.[12]

With the global expansion of the COVID-19 pandemic, the risk of coronavirus transmission via face-to-face interaction among individuals has led to extreme social distancing and self-quarantine policies. In this context, the provision of telehealth services such as telepharmacy has drawn more attention as a powerful tool to increase access to pharmacies and pharmaceutical care among remote or isolated populations. Telepharmacy contributes to decreasing the burden of the COVID-19 pandemic on the healthcare system by ensuring access to medications in need and improving drug dispensing safety (via reducing adverse reaction rates and medical errors).[13]

The COVID-19 pandemic has placed severe burden on public health, causing the healthcare systems in both developed and developing countries to be overwhelmed. According to the statistics provided by the Vietnamese Ministry of Health, the country has undergone 3 waves of the COVID-19 pandemic. The total numbers of COVID-19 cases were 415, 1135, and 1301 during the first, second, and third waves, respectively.[14] Vietnam is currently facing the fourth wave of the pandemic, which is considered the most dangerous since its outbreak in this country. In June and July 2021, the whole country recorded more than 10,000 cases per day.[14] HCMC, the most populous city in Vietnam, is the hardest-hit locality since the beginning of its fourth virus wave on April 27. HCMC imposed a 15 days partial lockdown from July 9, the second time after the first 22-day lockdown taken place in early April. Until July, there have been 8151 COVID-19 cases in HCMC which made the city lead nationwide regarding the number of confirmed cases (http://ncov.gov.vn). According to the HCMC Steering Committee for COVID-19 Prevention and Control, from April 27 to July 1, there were 4,345 community infections announced by the Ministry of Health, with mortality rate of 0.38 %. The emergence of the Delta variant further worsened the situation: the number of infections has increased exponentially in the country despite its extensive experience in dealing with the virus. HCMC, the most populous city in Vietnam, currently has the highest prevalence and mortality rate related to COVID-19.[14] The HCMC Government therefore has decided to take urgent measures to prevent the pandemic, including different levels of social distancing.

This approach makes it difficult for patients to get access to medical examinations, medicines, and counseling services, notably from May 31, 2021, when Directive 15 was applied across the city, and from July 9, 2021, when a lockdown was implemented under Directive 16. This was the period during which this study was carried out, with the aim of investigating the perspectives of pharmacists toward the importance of telepharmacy.

The nationwide deployment of telepharmacy, a reasonably new concept without relevant legal regulations in Vietnam, is predicted to be in line with healthcare needs and the trend of developing electronic health systems at present. HCMC plays a critical role in the implementation of information technologies to the healthcare sector in Vietnam. In the Smart Health Project for the period of 2021 to 2025, with a vision to 2030 of the HCMC Health Sector, building innovative healthcare is a prioritized group of activities to generate more utilities and increase people's satisfaction toward health care activities.[15] Developing a telepharmacy system with appropriate features is essential to meet the requirements of pharmacy practice in the "new normal", not only amid the present pandemic but also for future development. Therefore, this study was conducted to assess the current status of use and the factors associated with the willingness to use telepharmacy of pharmacists in respose to the COVID-19 pandemic from February to July 2021 in HCMC.

## Methods

### *Study Setting and Design*

This study was a cross-sectional online survey conducted from February to July 2021 in HCMC, Vietnam, using Microsoft Form.

Beside phone calls, social media is widely used worldwide. Zalo, with 100 million accounts in Vietnam, has helped its users to keep themselves updated on coronavirus-related information instantaneously and has improved public knowledge as well as risk awareness on the COVID-19 pandemic. As citizens became more familiar with self-protection measures and more cooperative with the government, this helped restrain the pandemic in Vietnam.

### *Study Participants*

Study participants were pharmacists working at private pharmacies or hospital pharmacies in HCMC. It is estimated that there are approximately 7393 private pharmacies and hospital pharmacies in HCMC (based on the list of pharmacies registered to sell stabilized drug prices in

2019-2020 and the data from the HCMC Health Department).[16] The formula to estimate sample size is as follows:

$$n = Z^2_{1-\alpha/2}\frac{p(1-p)}{d^2} \times DE$$

wherein $Z^2_{1-\alpha/2} = 1.96 \quad (\alpha = 0.05)$, $d = .05$ (permissible error is 5%), $p = .5$ (it is estimated that 50% of the pharmacists had an ICT application in pharmacy practice); design effect (DE) was assumed to be 2. The minimum calculated sample size was 392 subjects. An additional 5% was added to the sample size in case the responses did not meet the inclusion criteria, making the sample size to reach 412.

We randomly selected 600 pharmacies from 7393 private pharmacies and hospital pharmacies in the city to participate in the survey. An official invitation letter to participate in the survey was sent to all private pharmacies and hospital pharmacies in this area by the HCMC Health Department. The pharmacists received this letter via the Bureau of Pharmacy—HCMC Health Department with a survey questionnaire sent to hospitals and pharmacies with instructions to conduct the survey (URL: https://forms.office.com/r/4n5GmQRt6H). At least one person from each pharmacy participated in the survey. Those who consented to participate then accessed the online survey tool to submit their responses. A total of 414 participants were finally enrolled in our study.

### Data Collection

The questionnaire was designed based on previous research, which assessed the knowledge, attitude, and behavior of healthcare providers toward telemedicine application.[17-19] The questionnaire was then translated, synthesized, and reviewed by experts (including:1 Professor, 1 PhD holder, 2 Master's degree holders and 2 Pharmacists) to assess (1) the content of each question, (2) the level of importance of each question, and (3) the correlation between the questions. A trial study synthesizing 60 questionnaires showed that the Cronbach's Alpha for the Knowledge, Attitude, and Behavior scales were 0.865, 0.884, and 0.886, respectively (see Appendix – Table A1, A2, A3).

The structure of our questionnaire consists of the following parts:

- General information: age, sex, professional qualifications, years of working experience, pharmacy facility where they worked, ICT applications used to communicate with patients, ICT software to manage pharmacy practice, and level of payment to be invested in ICT application.
- Knowledge (11 questions).
- Attitude (8 questions).
- Behavior (7 questions).
- The question "Am I ready to apply telepharmacy in pharmacy practice?": assess the readiness to use telepharmacy.

Scores of knowledge, attitude, behavior, and readiness were calculated on a 5-point Likert-type scale (1 = *Strongly disagree*, 5 = *Strongly agree*). They were dichotomized into "Good" (for scores greater than 3) and "Poor" (for scores between 0 and 3).

### Statistical Analysis

All statistical analyses were performed using SPSS® version 20.0. The results were described by frequency and percentage tables. A chi-squared test was used to examine the association between 2 qualitative variables. Multiple variable logistic regression was used to examine the relationship between the readiness to apply telepharmacy with various factors. Statistical significance was established at the 5% level.

### Ethical Considerations

Only participants who voluntarily consented to participate in our study via online registration were recruited. All collected information was strictly confidential and would be used only for study purposes. The study was previously approved by the Ethical Review Committee of University of Medicine and Pharmacy at HCMC (No. 148/HĐĐ-ĐHYD dated 22/02/2021).

## Results

A total of 591 pharmacists consented to participate in our study and completed the online questionnaire. However, after cleaning the data and applying the inclusion criteria, only 414 pharmacists were included in the analysis. Most of these 414 participants were under 40 years old (78.5%), female (79.0%), and had less than 10 years of experience (59.9%).

As regards professional qualifications, most participants were bachelor of pharmacy (55.3%), then college graduates (16.4%), postgraduate degree holders (15.2%), and intermediate level graduates (13.0%). There were 206 pharmacists working in hospital pharmacies (49.8%) and 208 pharmacists working in private pharmacies (50.2%) (see Table 1).

Up to 86.7% of participants had telepharmacy applications in their pharmacy practice. Various types of telepharmacy applications were used, in which phone calls and Zalo were the most popular forms (83.6 and 72.7%, respectively). Zalo thereby had a positive impact on self-protection and cooperation with government of people and helped restraining the pandemic in Vietnam. Most pharmacists had

**Table 1.** Demographic Characteristics of Study Participants ($n = 414$).

| Characteristic | Frequency | % |
|---|---|---|
| Age (years) | | |
| ≤30 | 155 | 37.4 |
| 31–40 | 170 | 41.1 |
| 41–50 | 60 | 14.5 |
| 51–60 | 19 | 4.6 |
| >60 | 10 | 2.4 |
| Sex | | |
| Female | 327 | 79.0 |
| Male | 87 | 21.0 |
| Professional qualifications | | |
| Intermediate | 54 | 13.0 |
| College | 68 | 16.4 |
| University | 229 | 55.3 |
| Postgraduate | 63 | 15.2 |
| Work experience (years) | | |
| ≤10 | 248 | 59.9 |
| 11-20 | 129 | 31.2 |
| 21-30 | 23 | 5.6 |
| >30 | 14 | 3.4 |
| Workplace | | |
| Hospital pharmacy | 206 | 49.8 |
| Private pharmacy | 208 | 50.2 |

**Table 2.** Current Status and the Readiness to Apply Telepharmacy in Practice ($n = 414$).

| Characteristic | | Frequency | % |
|---|---|---|---|
| Do you use telepharmacy? | Yes | 359 | 86.7 |
| | No | 55 | 13.3 |
| Types of applications that 359 pharmacists used as telepharmacy ($n = 359$) | Phone call | 300 | 83.6 |
| | Zalo | 261 | 72.7 |
| | Facebook | 109 | 30.4 |
| | Viber | 64 | 17.8 |
| | Skype | 10 | 2.8 |
| | Zoom | 36 | 10.0 |
| | MS Team | 9 | 2.5 |
| | Facetime | 40 | 11.1 |
| | Others | 9 | 2.5 |
| Knowledge | Good | 258 | 62.3 |
| | Poor | 156 | 37.7 |
| Attitude | Good | 307 | 74.2 |
| | Poor | 107 | 25.8 |
| Behavior | Good | 243 | 58.7 |
| | Poor | 171 | 41.3 |
| Level of readiness | Ready | 361 | 87.2 |
| | Not ready | 53 | 12.8 |

a good knowledge, attitude, and behavior toward telepharmacy application in practice, accounting for 62.3%, 74.2%, and 58.7%, respectively. Over 87% of pharmacists were willing to use telepharmacy in pharmacy practice (Table 2).

The study found a statistically significant difference between the readiness levels to use telepharmacy on the following factors: workplace, knowledge, attitude, and behavior ($p < .005$; Table 3).

A logistic multivariate regression model was built to test some factors related to the level of readiness of telepharmacy. Variables with a $p$ value <.05 in the univariate analysis were included in the multivariate model. As seen in Table 4, the 2 factors having a statistically significant associations with the level of readiness were attitude with odds ratio [OR] = 4.67 (95% confidence interval [CI]: 2.26-9.66) and behavior with OR = 11.34 (95% CI: 3.84-33.45) ($p < .001$).

## Discussion

Identifying, tracking, and testing suspected patients as quickly as possible has been the most important approach to reduce community transmission of COVID-19. In attempt to facilitate these activities, ICTs were used to support patient confirmation and to send alert messages to the personal telephone of related individuals.[20] To our knowledge, this is the first study to survey the current status of use of telepharmacy by pharmacists during the COVID-19 outbreak in HCMC.

Of the 414 survey participants, 87% have used telepharmacy in their pharmacy practice (Table 2). This confirmed that the provision of medical information and remote medication counseling was an urgent need in the context of limited travels because of the pandemic. The ICT applications used by most pharmacists to communicate with patients were phone calls and Zalo messages (83.6 and 72.7%, respectively). This can be explained as phone calls and Zalo are the 2 most popular means of communication in Vietnam recently. Zalo is a multifunctional application built and developed by Vietnam, launched in 2012, and operated on mobile and computer platforms. The advantage of these 2 applications is that they are easy to use and can be installed on any electronic device such as phones, tablets, and laptops with simple and user-friendly features, even for the elderly.

Our findings are consistent with those reported in a study of Tortajada-Goitia *et al*, which reported that up to 87.6% of pharmacies had conducted remote consultations with patients during the pandemic.[21] A study of Koster *et al* carried out in the Netherlands (2020) reported different result compare to our study, with only 44.2% of pharmacists used telepharmacy.[22] This difference might be related to concerns about confidentiality, the privacy of information and the need for an apparent agreement between family doctors and pharmacists in medical consultation, which made pharmacists in the Netherlands apprehensive about using telepharmacy. In the context of the current COVID-19 pandemic, using ICTs has been considered a pivotal strategy to control the pandemic

creatively and successfully in many countries. For example, the Korean government used ICTs in a variety of ways to enhance crisis communication, coordinate large-scale public health efforts, and supply chains in the management of COVID-19 without the need to resort to extreme measures such as lockdowns.[20] Similarly, during the ongoing COVID-19 pandemic in Vietnam, in response to the appeal to support patients and reduce pressure on the healthcare system, a network of companion doctors and provision of health care bags were constructed. Thanks to these activities, patients could quickly contact pharmacists for medication consultations via publicly available phone numbers. In addition, patients in Vietnam had the habit of visiting pharmacies once they had symptoms of illness before seeing a doctor.[23] These factors partly explained why the proportion of using telepharmacy of pharmacists observed in our study was high.

A total of 62.3% of participated pharmacists achieved good level of knowledge, which was higher than the finding from a Saudi Arabian study in 2021 (58%).[24] The reason for the above difference may be related to different sample sizes and evaluation methods. The percentage of pharmacists who meet the requirements of attitude toward using telepharmacy was 74.2%, in line with their readiness and active interest in the use of telepharmacy in pharmacy practice. These findings support the plan to deploy the telepharmacy application system to provide an ideal platform to address the challenges facing the healthcare system, to respond promptly to patients' needs and prevent disease transmission effectively. A study in Ethiopia revealed that 64% of respondents had a favorable attitude toward using ICTs tools for remote monitoring, which was lower than our finding. While using ICTs requires gadgets such as smartphones and computers, only 80% of participants in this Ethiopian study owned smartphones and 66% of them had personal computers. It indicated that the lack of access to computers and smartphones can act as a barrier to the implementation of ICTs.[25] Regarding behaviors related to telepharmacy, 58.7% of pharmacists met the requirements of practice about using telepharmacy. Telepharmacy could deliver outstanding benefits. However, there remain some issues such as ensuring privacy, the confidentiality of patients' medical information as well as the actual working position of pharmacists participating in using telepharmacy, the type of technology used, and the role of the pharmacist. Besides, although the Ministry of Health of Vietnam has allowed the application of e-health in medical examination and treatment, currently, there is no project or policy to specifically regulate telepharmacy in Vietnam. Perhaps this is related to our observation that the percentage of pharmacists with good practice was not high.

We found that 87.2% of participants were willing to apply telepharmacy in pharmacy practice. This result was consistent with the Ethiopian study, wherein 83% of healthcare providers were willing to use one or more ICTs to support long-term patients.[25] A study in the United States on Telehealth showed that 28.57% of participants were likely to use ICTs in healthcare.[26] This variance might be due to differences in study population and the time of the study. In the context of the raging COVID-19 pandemic, the terms "Telehealth," "Telemedicine" had become more prevalent than ever. To meet the needs of patients during this outbreak, the psychological readiness to apply telepharmacy was a necessity. For example, with approximately 95% of people own a smartphone, text message alerts were used to provide practical information about COVID-19 in Korea.[20] Vietnam was the 10th country in the world in terms of smartphone users in 2020 with more than 61 million, according to a recent report on the global mobile market (Global Mobile Market Report by Newzoo). In 2020, HCMC's smartphone penetration rate was at 75.7% (Iris Marketing Report). In addition, the application of telepharmacy to support seafarers on oceanic vessels is very effective and optimizes the management of on-board pharmacies of commercial ships without medical staff.[27-29] This result reflected the preparedness of pharmacists to deploy telepharmacy applications in hospital and community pharmacies. This is a positive sign for the use of ICT in pharmaceutical practice.

There were significant associations between the willingness to apply telepharmacy in pharmacy practice and the workplace, knowledge, attitude, and practice of the pharmacists ($p < .05$; Table 3). Nevertheless, in the logistic regression model, only attitude and practice variables were statistically associated with the readiness of pharmacists ($p < .001$; Table 4). This was reasonable since pharmacists with a positive attitude would also have a higher level of willingness to apply telepharmacy in pharmacy practice. This result was in line with other previous studies conducted in Ethiopia and Spain.[25,30] The Ethiopian study (2021) reported that respondents who had a favorable attitude toward remote monitoring were more willing to use different ICT to support patients remotely (positive: 2.3, 95% CI: 1.1-4.7).[25] Also, when the practice of using telepharmacy was achieved, they were more active and ready to use this approach. Besides, another study that examined Dutch nurses' willingness to use Telehealth found other factors including perceived usefulness to the client, effort expectancy, social influence, and cost expectations.[31]

Despite the rapid implementation of COVID-19 prevention and control measures under the efforts of authorities at all levels and the healthcare system, the number of COVID-19 infections in HCMC continues to increase. In the past 3 months, the number of cases in Vietnam has increased by more than 10 000 cases per day, of which HCMC had more than 4,000 cases. The use of telepharmacy has become more common in the prevention of COVID-19. Therefore, it is necessary to build a telepharmacy application system to

**Table 3.** Some Factors Associated With the Level of Readiness of Telepharmacy ($n = 414$).

| Characteristic | Level of readiness | | Overall | $p$ value* |
|---|---|---|---|---|
| | Ready | Not ready | | |
| Age (years) | | | | |
| ≤30 | 130 (83.9%) | 25 (16.1%) | 155 (37.4%) | .255 |
| 31-40 | 152 (89.4%) | 18 (10.6%) | 170 (41.1%) | |
| 41-50 | 54 (90.0%) | 6 (10.0%) | 60 (14.5%) | |
| 51-60 | 15 (78.9%) | 4 (21.1%) | 19 (4.5%) | |
| >60 | 10 (100.0%) | 0 (0.0%) | 10 (2.4%) | |
| Sex | | | | |
| Female | 288 (88.1%) | 39 (11.9%) | 327 (79.0%) | .301 |
| Male | 73 (83.9%) | 14 (16.1%) | 87 (21.0%) | |
| Professional qualifications | | | | |
| Intermediate | 46 (85.2%) | 8 (14.8%) | 54 (13.0%) | .139 |
| College | 61 (89.7%) | 7 (10.3%) | 68 (16.4%) | |
| University | 194 (84.7%) | 35 (15.3%) | 229 (55.3%) | |
| Postgraduate | 60 (95.2%) | 3 (4.8%) | 63 (15.2%) | |
| Work experience (years) | | | | |
| ≤10 | 213 (85.9%) | 35 (14.1%) | 248 (59.9%) | .458 |
| 11-20 | 114 (88.4%) | 15 (11.6%) | 129 (31.2%) | |
| 21-30 | 20 (87.0%) | 3 (5.7%) | 23 (5.5%) | |
| >30 | 14 (100%) | 0 (0.0%) | 14 (3.4%) | |
| Workplace | | | | |
| Hospital pharmacy | 189 (91.7%) | 17 (8.3%) | 206 (49.8%) | **.006** |
| Private pharmacy | 172 (82.7%) | 36 (17.3%) | 208 (50.2%) | |
| Telepharmacy application | | | | |
| Yes | 315 (87.7%) | 44 (12.3%) | 359 (85.7%) | .396 |
| No | 46 (83.6%) | 9 (16.4%) | 55 (13.3%) | |
| Knowledge | | | | |
| Good | 243 (94.2%) | 15 (5.8%) | 258 (62.3%) | **<.001** |
| Poor | 118 (75.6%) | 38 (24.4%) | 156 (37.7%) | |
| Attitude | | | | |
| Good | 293 (95.4%) | 14 (4.6%) | 307 (74.2%) | **<.001** |
| Poor | 68 (63.6%) | 39 (36.4%) | 107 (25.8%) | |
| Behavior | | | | |
| Good | 239 (98.4%) | 4 (1.6%) | 243 (58.7%) | **<.001** |
| Poor | 122 (71.3%) | 49 (28.7%) | 171 (41.3%) | |
| Telepharmacy investment payout | | | | |
| <100 000 | 197 (84.5%) | 36 (15.5%) | 233 (56.3%) | .104 |
| 100 000-500 000 | 117 (90.7%) | 12 (9.3%) | 129 (31.2%) | |
| 500 000-1 000 000 | 30 (96.8%) | 1 (3.2%) | 31 (7.5%) | |
| >1 000 000 | 17 (81.0%) | 4 (19.05) | 21 (5.1%) | |

*Chi-square test.
Bold faced values is $p$ value. $p \leq 0.05$ is a statistically significant test result.

reduce the pressure on the healthcare system and enable patients to have timely access to pharmaceutical services in the situation of prolonged social distancing.

There are several limitations to this study. As data were collected via an online survey, the sample size and the representativeness of the sample relative to all pharmacists in HCMC could be a concern. Furthermore, the online setting of the survey could also lead to selection bias. However, only online survey could be an appropriate form to conduct the study during social distancing situation.

## Conclusions

This study showed that 86.7% of participated pharmacists had used telepharmacy, 87.2% of them were willing to apply telepharmacy in pharmacy practice in HCMC. The readiness was positively associated with attitude. Telepharmacy in pharmacy practice became more prevalent and practical during the COVID-19 outbreaks.[32] The deployment of using telepharmacy is consistent with the needs and capacity of providing telehealth services of pharmacists.

**Table 4.** The Logistic Multivariate Regression Model Tests Some Factors Related to the Level of Readiness of Telepharmacy ($n = 414$).

| | | Level of readiness | |
|---|---|---|---|
| Characteristic | | OR (95% CI) | *p* value |
| Workplace | Private pharmacy | 1 | .073 |
| | Hospital pharmacy | 1.94 (0.94-3.99) | |
| Knowledge | Poor | 1 | .022 |
| | Good | 2.38 (1.14-4.99) | |
| Attitude | Poor | 1 | **<.001** |
| | Good | 4.67 (2.26-9.66) | |
| Behavior | Poor | 1 | **<.001** |
| | Good | 11.34 (3.84-33.45) | |

Abbreviations: CI, confidence interval; OR, odds ratio.
Bold faced values is *p* value. $p \leq 0.05$ is a statistically significant test result.

## Appendix[33,34]

**Table A1.** Cronbach's Alpha Results and Variables of the Knowledge Scale.

| Variable name | Content | Cronbach's alpha |
|---|---|---|
| K1 | Telepharmacy is the provision of pharmaceutical-related services through the application of ICT. | 0.865 |
| K2 | Pharmacists can discuss directly and promptly with doctors if a patient's prescription has problems with interactions, ADRs, and make consensus/adjustments if necessary. | |
| K3 | Pharmacists advice and guide the use of drugs for inpatients/outpatients via the video call feature. | |
| K4 | Pharmacists can collect information and report on ADRs, drug interactions that occur during the patient's medication use. | |
| K5 | Pharmacists are supported and professionally trained | |
| K6 | Pharmacists get updated information about eCME (continuous training) courses | |
| K7 | Patients are updated with electronic medical records, clinical indicators, and treatment drug information | |
| K8 | Patients will be automatically prompted for information about drug use (when to take, how to use). | |
| K9 | Patients will receive private reminders about lifestyle changes that are right for them | |
| K10 | Patients will receive a message reminding of the follow-up appointment | |
| K11 | Telepharmacy can assist in many routine activities of pharmacists | |

Abbreviation: ICT, information and communication technology.

**Table A2.** Cronbach's Alpha Results and Variables of the Attitude Scale.

| Variable name | Content | Cronbach's alpha |
|---|---|---|
| A1 | Knowledge of computers and the applications of ICT in the medical field is a must for pharmacists | 0.884 |
| A2 | The application of ICT is essential to the work of pharmacists | |
| A3 | The application of ICT is imperative for the work of pharmacists | |
| A4 | Telepharmacy provides pharmaceutical-related services to patients at a distance | |
| A5 | Creates favorable conditions for consulting and guiding the use of drugs for patients | |
| A6 | Encourages teamwork among medical professionals (doctors, pharmacists, etc.) to improve the quality of health care | |
| A7 | Helps increase the opportunity for information exchange between pharmacists and patients, pharmacists, and doctors | |
| A8 | Helps pharmacists get the job done faster | |

**Table A3.** Cronbach's Alpha Results and Variables of the Practice Scale.

| Variable name | Content | Cronbach's alpha |
|---|---|---|
| P1 | I will attend training courses on ICT application in pharmacy practice | 0.886 |
| P2 | I am willing to update my knowledge about ICT application | |
| P3 | I am willing to cooperate with ICT companies to upgrade my ICT system | |
| P4 | I am willing to participate in training courses on telepharmacy application in pharmacy practice | |
| P5 | I am willing to pay for ICT application | |
| P6 | I think there should be documentation and a plan to implement telepharmacy | |
| P7 | I think there should be a policy regulating the application of telepharmacy | |

Abbreviation: ICT, information and communication technology.

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## Author Contributions

T.V.D. was responsible for the idea, formulation or evolution of overarching research goals and aims, and supervision. Development or design of methodology; creation of models were done by all authors under the supervision of N.T.H., H.Y.N.T, and T.D.T. Conducting a research and investigation process, data collection were done by T.V.D., N.T.M., T.T.H.N., N.N.A.Q., N.T.N.T., D.T.T.T., N.H.L.T., M.T.V.N., and P.H.V.N. T.V.D. and T.D.T. took the lead in writing the manuscript. All authors contributed to the manuscript writing and gave approval of the final version.

## Declaration of Conflicting Interests

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