

1 **Pharmacists' perspectives on the use of Telepharmacy in response to COVID-19**  
2 **pandemic in Ho Chi Minh City, Vietnam**

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53 TVD was responsible for the idea, formulation or evolution of overarching research goals and  
54 aims and supervision. Development or design of methodology; creation of models were done  
55 by all authors under the supervision of NTH, HYNT, TDT. Conducting a research and  
56 investigation process, data collection were done by TVD, NTM, TTHN, NNAQ, NTNT, DTTT,  
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## 65 **ABSTRACT**

66 **Introduction:** Telepharmacy, the application of information and communication technologies  
67 in healthcare services, has been adopted in many countries to provide patients with  
68 pharmaceutical care. However, it has yet to be widely used in Vietnam. This study was  
69 conducted to assess the current status of use and the factors associated with the willingness to  
70 use Telepharmacy of pharmacists in Vietnam.

71 **Methods:** A descriptive cross-sectional study was conducted from February to July 2021; 414  
72 pharmacists were recruited to fill in an online survey.

73 **Results:** Overall, 86.7% of participants have used Telepharmacy application and 87.2% of them  
74 were willing to apply Telepharmacy in pharmacy practice. According to our multivariate  
75 analysis, the level of readiness was associated with positive attitude (OR=4.67; 95% CI: 2.26-  
76 9.66), and a good behavior (OR=11.34; 95% CI: 3.84-33.45).

77 **Discussion:** Developing a Telepharmacy system with appropriate features is essential to meet  
78 the requirements of pharmacy practice amid the spread of the COVID-19 pandemic.

79 **Keywords:** COVID-19, pharmacist, pandemic, Telepharmacy, Vietnam.

## 80 INTRODUCTION

81 Telepharmacy is the delivery of pharmaceutical care by pharmacists via the use of  
82 information and communication technologies (ICT) to patients at a distance.<sup>1</sup> Telepharmacy is  
83 particularly useful in assisting healthcare facilities to perform pharmacy operations in the  
84 absence of pharmacists or when pharmacy resources are limited.<sup>27</sup> According to the 2018 Health  
85 statistics yearbook of the Vietnamese Ministry of Health, the number of pharmacists per 1,000  
86 inhabitants was 0.29 in Vietnam, and was 0.06 in Ho Chi Minh City (HCMC). Therefore,  
87 applying telepharmacy is necessary in order to limit of health care resources. For example, in  
88 northwest Queensland, thanks to Telepharmacy, the Mount Isa Base Hospital was able to  
89 interact with patients and provide clinical care to remote areas where there were no available  
90 on-site pharmacists.<sup>2</sup> In addition, a meta-analysis of 21 articles from 2010 to 2020 has shown  
91 that Telepharmacy has the potential to enhance pharmacy services in oncology care, including  
92 follow-up monitoring and counseling, intravenous chemotherapy and sterile compounding,  
93 expanding the availability of pharmacy services, and remote education.<sup>3</sup> Telepharmacy has  
94 been adopted in many parts of the world since 2001, especially in North America (the United  
95 States, Canada),<sup>4-7</sup> Europe (Spain)<sup>8-9</sup> and Oceania (Australia).<sup>10</sup>

96 With the global expansion of the COVID-19 pandemic, the risk of coronavirus  
97 transmission via face-to-face interaction among individuals has led to extreme social distancing  
98 and self-quarantine policies. In this context, the provision of telehealth services such as  
99 Telepharmacy has drawn more attention as a powerful tool to increase access to pharmacies  
100 and pharmaceutical care among remote or isolated populations. Telepharmacy contributes to  
101 decreasing the burden of the COVID-19 pandemic on the healthcare system by ensuring access  
102 to medications in need and improving drug dispensing safety (via reducing adverse reaction  
103 rates and medical errors).<sup>11</sup> A study in all seven states of the United Arab Emirates reported that  
104 Telepharmacy has been used to provide pharmaceutical care to 19,974 patients over four  
105 months, which was two times higher than the number of patients cared by pharmacies that did  
106 not use this service. Notably, the rates of medication dispensing errors, prescription-related  
107 errors and pharmacist counseling errors were significantly lower in pharmacies with  
108 Telepharmacy.<sup>12</sup>

109 The COVID-19 pandemic has placed severe burden on public health, causing the  
110 healthcare systems in both developed and developing countries to be overwhelmed. According  
111 the statistics provided by the Vietnamese Ministry of Health, the country has undergone three  
112 waves of the COVID-19 pandemic. The total numbers of COVID-19 cases were 415, 1135 and  
113 1301 during the first, second, and third waves, respectively.<sup>13</sup> HCMC is the hardest-hit locality  
114 in Vietnam since the beginning of its fourth virus wave on April 27. HCMC imposed a 15 days

115 partial lockdown from July 9, the second time after the first taken in early April for 22 days.  
116 Until July, it has reported 8,151 Covid-19 cases in HCMC, taking the lead nationwide in terms  
117 of confirmed cases (<http://ncov.gov.vn>). Vietnam is currently facing the fourth wave of the  
118 pandemic, which is considered the most dangerous since its outbreak in this country. In June  
119 and July 2021, the whole country recorded more than 10,000 cases per day.<sup>13</sup> According to the  
120 HCMC Steering Committee for COVID-19 Prevention and Control, from April 27 to July 1,  
121 there were 4,345 community infections announced by the Ministry of Health, with mortality  
122 rate of 0.38 %. The emergence of the Delta variant further worsened the situation: the number  
123 of infections has increased exponentially in the country despite its extensive experience in  
124 dealing with the virus. HCMC, the most populous city in Vietnam, currently has the highest  
125 prevalence and mortality rate related to COVID-19.<sup>13</sup> The City Government has decided to take  
126 urgent measures to prevent the pandemic, including different levels of social distancing.

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

132 A reasonably new concept without relevant legal regulations in Vietnam, the nationwide  
133 deployment of Telepharmacy is predicted to be in line with healthcare needs and the trend of  
134 developing electronic health systems at present. HCMC plays a critical role in the  
135 implementation of information technologies to the healthcare sector in Vietnam. In the Smart  
136 Health Project for the period of 2021 to 2025, with a vision to 2030 of the HCMC Health Sector,  
137 building innovative healthcare is a prioritized group of activities to generate more utilities and  
138 increase people's satisfaction towards health care activities.<sup>14</sup> Therefore, this study was  
139 conducted to assess the current status of use and the factors associated with the willingness to  
140 use Telepharmacy of pharmacists to respond to the Covid-19 pandemic from February to July  
141 2021 in HCMC. Developing a Telepharmacy system with appropriate features is essential to  
142 meet the requirements of pharmacy practice not only amid the present pandemic but also for  
143 future development.

## 144 **METHODS**

### 145 *Study Setting and Design*

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

148 Beside phone calls, social media is widely used around the world nowadays. Zalo, with  
149 100 million accounts in Vietnam, has helped its users to keep themselves updated on  
150 coronavirus-related information instantaneously, and has improved public knowledge as well  
151 as risk awareness on the COVID-19 pandemic. As citizens became more familiar with self-

152 protection measures and more cooperative with the government, this helped restrain the  
153 pandemic in Vietnam.

#### 154 *Study participants*

155 Study participants were pharmacists working at private pharmacies or hospital  
156 pharmacies in HCMC. It is estimated that there are approximately 7393 private pharmacies and  
157 hospital pharmacies in HCMC (based on the list of pharmacies registered to sell stabilized drug  
158 prices in 2019 - 2020 and the data from the HCMC Health Department).<sup>15</sup> The formula to  
159 estimate sample size is as follows:

$$160 \quad n = Z_{1-\alpha/2}^2 \frac{p(1-p)}{d^2} \times DE$$

161 Wherein:  $Z_{1-\alpha/2}^2 = 1.96$  ( $\alpha = 0.05$ ),  $d=0.05$  (permissible error is 5%),  $p=0.5$  (it is  
162 estimated that 50% of the pharmacists had an ICT application in pharmacy practice); design  
163 effect (DE) was assumed to be 2. The minimum calculated sample size was 392 subjects. An  
164 additional 5% was added to the sample size in case the responses did not meet the inclusion  
165 criteria, making the sample size to reach 412.

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

#### 175 *Data Collection*

176 The questionnaire was designed based on previous research, which assessed the  
177 knowledge, attitude, and behavior of healthcare providers toward telemedicine application.<sup>16-</sup>  
178 <sup>18</sup> The questionnaire was then translated, synthesized and reviewed by experts (including:  
179 1 Professor, 1 PhD holder, 2 Master's degree holders and 2 Pharmacists) to assess (i) the content  
180 of each question, (ii) the level of importance of each question and (iii) the correlation of the  
181 questions. A trial study synthesizing 60 questionnaires showed that the Cronbach's Alpha for  
182 the Knowledge, Attitude, and Behavior scales were 0.865, 0.884 and 0.886, respectively.

183 The structure of our questionnaire consists of the following parts:

- 184                   • General information: Age, gender, professional qualifications, years of working  
185 experience, pharmacy facility where they worked, ICT applications used to communicate with  
186 patients, ICT software to manage pharmacy practice, level of payment to be invested in ICT  
187 application.
- 188                   • Knowledge (11 questions).
- 189                   • Attitude (8 questions).
- 190                   • Behavior (7 questions).
- 191           • The question “Am I ready to apply Telepharmacy in pharmacy practice?”: assess the  
192 readiness to use telepharmacy.

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

### 196 *Statistical Analysis*

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

### 202 *Ethical Considerations*

203           Only participants who voluntarily consented to participate in our study via online  
204 registration were recruited. All collected information was strictly confidential and would be  
205 used only for study purposes. The study was previously approved by the Ethical Review  
206 Committee of University of Medicine and Pharmacy at HCMC (No. 148/HDD-DHYD dated  
207 22/02/2021).

208

## 209 **RESULTS**

210           A total of 591 pharmacists consented to participate in our study and completed the  
211 online questionnaire. However, after cleaning the data and applying the inclusion criteria, only  
212 414 pharmacists were included in the analysis. The majority of these 414 participants were  
213 under 40 years old (78.5%), female (79.0%) and had less than 10 years of experience (59.9%).

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

218 Up to 86.7% of participants had Telepharmacy applications in their pharmacy practice.  
219 Various types of Telepharmacy applications were used, in which phone calls and Zalo were the  
220 most popular forms (83.6% and 72.7%, respectively). Zalo thereby had a positive impact on  
221 self-protection and cooperation with government of people and helped restraining the pandemic  
222 in Vietnam. Most pharmacists had a good knowledge, attitude, and behavior toward  
223 Telepharmacy application in practice, accounting for 62.3%, 74.2% and 58.7%, respectively.  
224 Over 87% of pharmacists were willing to use Telepharmacy in pharmacy practice (Table 2).

225 The study found a statistically significant difference between the readiness levels to  
226 use Telepharmacy depending on the following factors: workplace, knowledge, attitude and  
227 behavior ( $p < 0.005$ ) (Table 3).

228 A logistic multivariate regression model was built to test some factors related to the level  
229 of readiness of Telepharmacy. Variables with a p-value  $< 0.05$  in the univariate analysis were  
230 included in the multivariate model. As seen in Table 4, the two factors having a statistically  
231 significant association with the level of readiness are attitude OR=4.67 (95%CI 2.26 – 9.66)  
232 and behavior OR=11.34 (95%CI: 3.84 – 33.45) ( $p < 0.001$ ).

## 233 **DISCUSSION**

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

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

249 Our findings are consistent with those reported in a study of Tortajada-Goitia *et al*, which  
250 reported that up to 87.6% of pharmacies had conducted remote consultations with patients during



251 the pandemic.<sup>20</sup> A study of Koster *et al* carried out in the Netherlands (2020) reported a result  
252 different from that of our study, with only 44.2% of pharmacists used Telepharmacy.<sup>21</sup> This  
253 difference might be related to concerns about confidentiality, the privacy of information and the  
254 need for an apparent agreement between family doctors and pharmacists in medical consultation,  
255 which made pharmacists in the Netherlands apprehensive about using Telepharmacy. In the context  
256 of the current COVID-19 pandemic, using ICTs has been considered pivotal strategy to control the  
257 pandemic creatively and successfully in many countries. For example, the Korean government used  
258 ICTs in a variety of ways to enhance crisis communication, coordinate large-scale public health  
259 efforts and supply chains in the management of COVID-19 without the need to resort to extreme  
260 measures such as lockdowns.<sup>19</sup> Similarly, during the ongoing COVID-19 pandemic in Vietnam, in  
261 response to the appeal to support patients and reduce pressure on the healthcare system, a network  
262 of companion doctors and provision of health care bags were constructed. Thanks to these activities,  
263 patients could quickly contact pharmacists for medication consultations via publicly available  
264 phone numbers. In addition, patients in Vietnam had the habit of visiting pharmacies once they had  
265 symptoms of illness before seeing a doctor.<sup>31</sup> These factors partly explained why the proportion of  
266 using Telepharmacy of pharmacists in our study was high.

267 A total of 62.3% of participated pharmacists achieved good level of knowledge, which was  
268 higher than the finding from a Saudi Arabian study in 2021 (58%).<sup>22</sup> The reason for the above  
269 difference may be related to different sample sizes and evaluation methods. The percentage of  
270 pharmacists who meet the requirements of attitude toward using Telepharmacy was 74.2%, in line  
271 with their readiness and active interest in the use of Telepharmacy in pharmacy practice. These  
272 findings support the plan to deploy the Telepharmacy application system to provide an ideal  
273 platform to address the challenges facing the healthcare system, to respond promptly to patients'  
274 needs and prevent disease transmission effectively. A study in Ethiopia revealed that 64% of  
275 respondents had a favorable attitude toward using ICTs tools for remote monitoring, which was  
276 lower than our finding. While using ICTs requires gadgets such as smartphones and computers,  
277 only 80% of participants in this Ethiopian study owned smartphones and 66% of them had personal  
278 computers. It indicated that the lack of access to computers and smartphones can act as a barrier to  
279 the implantation of ICTs.<sup>23</sup> Regarding behaviors related to Telepharmacy, 58.7% of pharmacists  
280 met the requirements of practice about using Telepharmacy. Telepharmacy could deliver  
281 outstanding benefits. However, there remain some issues such as ensuring privacy, the  
282 confidentiality of patients' medical information as well as the actual working position of  
283 pharmacists participating in using Telepharmacy, the type of technology used and the role of the  
284 pharmacist. Besides, although the Ministry of Health of Vietnam has allowed the application of e-  
285 health in medical examination and treatment, currently, there is no project or policy to specifically

286 regulate Telepharmacy in Vietnam. Perhaps this is related to our observation that the percentage of  
287 pharmacists with good practice was not high.

288 We found that 87.2% of participants were willing to apply Telepharmacy in pharmacy  
289 practice. This result was consistent with the Ethiopian study, wherein 83% of healthcare providers  
290 were willing to use one or more ICTs to support chronic patients.<sup>23</sup> A study in the United States on  
291 Telehealth showed that 28.57% of participants were likely to use ICTs in healthcare.<sup>24</sup> This variance  
292 might be due to differences in study population and the time of the study. In the context of the raging  
293 COVID-19 pandemic, the terms "Telehealth", "Telemedicine" had become more prevalent than  
294 ever. To meet the needs of patients during this outbreak, the psychological readiness to apply  
295 Telepharmacy was a necessity. For example, with approximately 95% of people own a smartphone,  
296 text message alerts were used to provide practical information about COVID-19 in Korea.<sup>19</sup>  
297 Vietnam was the 10<sup>th</sup> country in the world in terms of smartphone users in 2020 with more than 61  
298 million, according to a recent report on the global mobile market (Global Mobile Market Report by  
299 Newzoo). In 2020, HCMC's smartphone penetration rate was at 75.7% (Iris Marketing Report). In  
300 addition, the application of Telepharmacy to support seafarers on oceanic vessels is very effective  
301 and optimizes the management of on-board pharmacies of commercial ships without medical  
302 staff.<sup>28-30</sup> This result reflected the preparedness of pharmacists to deploy Telepharmacy applications  
303 in hospital and community pharmacies. This is a positive sign for the use of ICT in pharmaceutical  
304 practice.

305 There were significant associations between the willingness to apply Telepharmacy in  
306 pharmacy practice and the workplace, knowledge, attitude, and practice of the pharmacists ( $p < 0.05$ )  
307 (Table 3). Nevertheless, in the logistic regression model, only attitude and practice variables were  
308 statistically associated with the readiness of pharmacists ( $p < 0.001$ ) (Table 4). This was reasonable  
309 since pharmacists with a positive attitude would also have a higher level of willingness to apply  
310 Telepharmacy in pharmacy practice. This result was in line with other previous studies conducted  
311 in Ethiopia and Spain.<sup>23,25</sup> The Ethiopian study (2021) reported that respondents who had a  
312 favourable attitude towards remote monitoring were more willing to use different ICT to support  
313 patients remotely (positive: 2.3, 95% CI: 1.1 to 4.7).<sup>23</sup> Also, when the practice of using  
314 Telepharmacy was achieved, they were more active and ready to use this approach. Besides,  
315 another study that examined Dutch nurses' willingness to use Telehealth found other factors  
316 including perceived usefulness to the client, effort expectancy, social influence and cost  
317 expectations.<sup>26</sup>

318 Despite the rapid implementation of COVID-19 prevention and control measures under the  
319 efforts of authorities at all levels and the healthcare system, the number of COVID-19 infections in

320 HCMC continues to increase. In the past three months, the number of cases in Vietnam has  
321 increased by more than 10,000 cases per day, of which HCMC had more than 4,000 cases. The  
322 use of Telepharmacy has become more common in the prevention of COVID-19. Therefore, it  
323 is necessary to build Telepharmacy application system to reduce the pressure on the healthcare  
324 system, enable patients to have timely access to pharmaceutical services in the situation of  
325 prolonged social distancing.

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

331

## 332 **CONCLUSIONS**

333 This study showed that 86.7% of participated pharmacists had used Telepharmacy, 87.2%  
334 of them were willing to apply Telepharmacy in pharmacy practice in HCMC. The readiness  
335 was positively associated with attitude. Telepharmacy in pharmacy practice became more  
336 prevalent and practical during the COVID-19 outbreaks.<sup>32</sup> The deployment of using  
337 Telepharmacy is consistent with the needs and capacity of providing Telehealth services of  
338 pharmacists.

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352   **REFERENCES**

- 353   1.    Win AZ. Telepharmacy: Time to pick up the line. *Res Soc Adm Pharm [Internet]*.  
354       2017;13(4):882–3. Available from: <http://dx.doi.org/10.1016/j.sapharm.2015.06.002>
- 355   2.    McFarland R. Telepharmacy for remote hospital inpatients in north-west Queensland. *J*  
356       *Telemed Telecare*. 2017;23(10):861–5.
- 357   3.    Vo AT, Gustafson DL. Telepharmacy in oncology care: A scoping review. *J Telemed*  
358       *Telecare*. 2020;0(0):1-12.
- 359   4.    Casey MM, Sorensen TD, Elias W, Knudson A, Gregg W. Current practices and state  
360       regulations regarding telepharmacy in rural hospitals. *Am J Heal Pharm*.  
361       2010;67(13):1085–92.
- 362   5.    Wakefield DS, Ward MM, Loet JL, O'Brien J, Sperry L. Implementation of a  
363       telepharmacy service to provide round-the-clock medication order review by  
364       pharmacists. *Am J Health Syst Pharm [Internet]*. 2010 Dec 1;67(23):2052–7. Available  
365       from: <https://pubmed.ncbi.nlm.nih.gov/21098378/>
- 366   6.    Kosmisky DE, Everhart SS, Griffiths CL. Implementation, Evolution and Impact of ICU  
367       Telepharmacy Services Across a Health care System. *Hosp Pharm*. 2019;54(4):232–40.
- 368   7.    Killeen RM, Grindrod K, Ong SW. Innovations in practice: Telepharmacy’s time has  
369       arrived. *Can Pharm J CPJ [Internet]*. 2020 Sep 1;153(5):252. Available from:  
370       /[pmc/articles/PMC7560556/](https://pubmed.ncbi.nlm.nih.gov/34111111/)
- 371   8.    Margusino-Framiñán L, Illarro-Uranga A, Lorenzo-Lorenzo K, Monte-Boquet E,  
372       Márquez-Saavedra E, Fernández-Bargiela N, et al. Atención farmacéutica al paciente  
373       externo durante la pandemia COVID-19. *Telefarmacia. Farm Hosp*. 2020;44(7):61–5.
- 374   9.    Morillo-Verdugo R, Margusino-Framiñán L, Monte-Boquet E, Morell-Baladrón A,  
375       Barreda-Hernández D, Rey-Piñeiro XM, et al. Spanish society of hospital pharmacy  
376       position statement on telepharmacy: Recommendations for its implementation and  
377       development. *Farm Hosp*. 2020;44(4):174–81.
- 378   10.   Poudel A, Nissen L. Telepharmacy: a pharmacist’s perspective on the clinical  
379       benefits and challenges [Corrigendum]. *Integr Pharm Res Pract*. 2016;Volume 5:83–4.
- 380   11.   Mohamed Ibrahim O, Ibrahim RM, Abdel-Qader DH, Al Meslamani AZ, Al Mazrouei  
381       N. Evaluation of Telepharmacy Services in Light of COVID-19. *Telemed e-Health*.  
382       2021;27(6):649–56.
- 383   12.   Ibrahim OM, Ibrahim RM, Z Al Meslamani A, Al Mazrouei N. Role of telepharmacy in

- 384 pharmacist counselling to coronavirus disease 2019 patients and medication dispensing  
385 errors. *J Telemed Telecare*. 2020;(27272).
- 386 13. Ministry of Health of Vietnam - News page about acute respiratory infections Covid –  
387 19. [Internet]. Available from: <https://covid19.gov.vn/>
- 388 14. Propaganda Department Party Committee of Health Department. Road for building  
389 “Smart Health” of the Health Sector of Ho Chi Minh City, [Internet]. Available from:  
390 [http://medinet.gov.vn/hoat-dong-dang-doan-the/lo-trinh-xay-dung-y-te-thong-minh-](http://medinet.gov.vn/hoat-dong-dang-doan-the/lo-trinh-xay-dung-y-te-thong-minh-cua-nganh-y-te-thanh-pho-ho-chiminh-so-y-te-c4718-40688.aspx)  
391 [cua-nganh-y-te-thanh-pho-ho-chiminh-so-y-te-c4718-40688.aspx](http://medinet.gov.vn/hoat-dong-dang-doan-the/lo-trinh-xay-dung-y-te-thong-minh-cua-nganh-y-te-thanh-pho-ho-chiminh-so-y-te-c4718-40688.aspx).
- 392 15. Ho Chi Minh City Department of Health. List of pharmacies registered to participate in  
393 the sale of stabilized drugs in 2019-2020 [Internet]. Available from:  
394 [http://www.medinet.hochiminhcity.gov.vn/chuyen-muc/danh-book-cac-nha-thuoc-](http://www.medinet.hochiminhcity.gov.vn/chuyen-muc/danh-book-cac-nha-thuoc-dang-ky-join-ban-thuoc-binh-on-nam-2019-2020-cmobile1044-22153.aspx)  
395 [dang-ky-join-ban-thuoc-binh-on-nam-2019-2020-cmobile1044-22153.aspx](http://www.medinet.hochiminhcity.gov.vn/chuyen-muc/danh-book-cac-nha-thuoc-dang-ky-join-ban-thuoc-binh-on-nam-2019-2020-cmobile1044-22153.aspx)
- 396 16. Meher SK, Tyagi RS, Chaudhry T. Q. Awareness among doctors and patients in India.  
397 2009;139–41.
- 398 17. Eshita IR. Knowledge and Attitude of The Physicians Toward Telemedicine. *Glob Sci J*  
399 [Internet]. 2017;5(12):85–146. Available from:  
400 [http://www.globalscientificjournal.com/researchpaper/KNOWLEDGE-AND-](http://www.globalscientificjournal.com/researchpaper/KNOWLEDGE-AND-ATTITUDE-OF-THE-PHYSICIANS-TOWARD-TELEMEDICINE.pdf)  
401 [ATTITUDE-OF-THE-PHYSICIANS-TOWARD-TELEMEDICINE.pdf](http://www.globalscientificjournal.com/researchpaper/KNOWLEDGE-AND-ATTITUDE-OF-THE-PHYSICIANS-TOWARD-TELEMEDICINE.pdf)
- 402 18. Parvin R, Mcps S. Knowledge, Attitude, and Practice of E-Health Among Doctors  
403 Working At Selected Private Hospitals in Dhaka, Bangladesh. *J Int Soc Telemed eHealth*.  
404 2016;4(April 1995):15–6.
- 405 19. Paek HJ, Hove T. Information Communication Technologies (ICTs), Crisis  
406 Communication Principles and the COVID-19 Response in South Korea. *J Creat*  
407 *Commun*. 2021;16(2):213–21.
- 408 20. Tortajada-Goitia B, Morillo-Verdugo R, Margusino-Framiñán L, Marcos JA, Fernández-  
409 Llamazares CM. Survey on the situation of telepharmacy as applied to the outpatient  
410 care in hospital pharmacy departments in Spain during the COVID-19 pandemic. *Farm*  
411 *Hosp*. 2020;44(4):135–40.
- 412 21. Koster ES, Philbert D, Bouvy ML. Impact of the COVID-19 epidemic on the provision  
413 of pharmaceutical care in community pharmacies. *Res Soc Adm Pharm*.  
414 2021;17(1):2002–4. Available from: <https://doi.org/10.1016/j.sapharm.2020.07.001>
- 415 22. Alanazi A, Albarrak A, Alanazi A, Muawad R. Knowledge and attitude assessment of

- 416 pharmacists toward telepharmacy in Riyadh City, Saudi Arabia. *Eur J Hosp Pharm.*  
417 2021;7(Suppl 1):2021.
- 418 23. Seboka BT, Yilma TM, Birhanu AY. Factors influencing healthcare providers' attitude  
419 and willingness to use information technology in diabetes management. *BMC Med*  
420 *Inform Decis Mak.* 2021;21(1).
- 421 24. Rortvedt D, Jacobs K. Perspectives on the use of a telehealth service-delivery model as  
422 a component of school-based occupational therapy practice: Designing a user-experience.  
423 *Work.* 2019;62(1):125–31.
- 424 25. Asua J, Orruño E, Reviriego E, Gagnon MP. Healthcare professional acceptance of  
425 telemonitoring for chronic care patients in primary care. *BMC Med Inform Decis Mak.*  
426 2012;12(1).
- 427 26. Montgomery C. Implications for Practice and Education. *Heal through Commun Pract*  
428 *Caring.* 2014;127–34.
- 429 27. Baldoni S, Pallotta G, Traini E, Sagaro GG, Nittari G, Amenta F. A survey on feasibility  
430 of telehealth services among young Italian pharmacists. *Pharm Pract (Granada).* 2020  
431 Jul-Sep;18(3):1926. doi: 10.18549/PharmPract.2020.3.1926.
- 432 28. Nittari G, Pallotta G, Khuman RS, Amenta F. TelePharmaSea: proposing a novel  
433 approach to automate, organize and simplify management of medical chest on board  
434 commercial vessels. *Int Marit Health.* 2020;71(4):291-295. doi:  
435 10.5603/IMH.2020.0049.
- 436 29. Nittari G, Peretti A, Sibilio F, Ioannidis N, Amenta F. Development of software for  
437 handling ship's pharmacy. *Int Marit Health.* 2016;67(2):72-8. doi:  
438 10.5603/IMH.2016.0015.
- 439 30. Nittari G, Pallotta G, Pirillo I, Ricci G, Amenta F. Evaluation of medical prescriptions  
440 and off-label use on board ships to improve healthcare quality. *Eur Rev Med Pharmacol*  
441 *Sci.* 2018 Jul;22(13):4392-4400. doi: 10.26355/eurrev\_201807\_15439.
- 442 31. Hoai NT, Dang T. The determinants of self-medication: Evidence from urban Vietnam.  
443 *Soc Work Health Care.* 2017 Apr;56(4):260-282. doi: 10.1080/00981389.2016.1265632.  
444 Epub 2017 Jan 23.
- 445 32. Elizabeth J. Unni, Kanchita Patel, Isaac Rex Beazer, and Man Hung. Telepharmacy  
446 during COVID-19: A Scoping Review. *Pharmacy (Basel).* 2021, Dec;9(4):183.
- 447

448 **TABLE**

449

450 *Table 1. Demographic characteristics of study participants (n = 414)*

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

451

*Table 2. Current status and the readiness to apply Telepharmacy in practice (n = 414)*

<b>Characteristic</b>		<b>Frequency</b>	<b>Percentage</b>
<b>Telepharmacy application</b>	Yes	359	86.7
	No	55	13.3
<b>Types of applications (n=359)</b>	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
<b>Knowledge</b>	Good	258	62.3
	Poor	156	37.7
<b>Attitude</b>	Good	307	74.2
	Poor	107	25.8
<b>Behavior</b>	Good	243	58.7
	Poor	171	41.3
<b>Level of readiness</b>	Ready	361	87.2
	Not ready	53	12.8



**Table 3. Some factors associated with the level of readiness of Telepharmacy (n=414)**

Characteristic	Level of readiness		Overall	P-value*
	Ready	Not ready		
<b>Age (years)</b>				
≤ 30	130 (83.9%)	25 (16.1%)	155 (37.4%)	
31 – 40	152 (89.4%)	18 (10.6%)	170 (41.1%)	
41 – 50	54 (90.0%)	6 (10.0%)	60 (14.5%)	0.255
51 – 60	15 (78.9%)	4 (21.1%)	19 (4.5%)	
> 60	10 (100.0%)	0 (0.0%)	10 (2.4%)	
<b>Gender</b>				
Female	288 (88.1%)	39 (11.9%)	327 (79.0%)	0.301
Male	73 (83.9%)	14 (16.1%)	87 (21.0%)	
<b>Professional qualifications</b>				
Intermediate	46 (85.2%)	8 (14.8%)	54 (13.0%)	
College	61 (89.7%)	7 (10.3%)	68 (16.4%)	0.139
University	194 (84.7%)	35 (15.3%)	229 (55.3%)	
Postgraduate	60 (95.2%)	3 (4.8%)	63 (15.2%)	
<b>Work experience (years)</b>				
≤ 10	213 (85.9%)	35 (14.1%)	248 (59.9%)	
11 – 20	114 (88.4%)	15 (11.6%)	129 (31.2%)	0.458
21 – 30	20 (87.0%)	3 (5.7%)	23 (5.5%)	
> 30	14 (100%)	0 (0.0%)	14 (3.4%)	
<b>Workplace</b>				
Hospital pharmacy	189 (91.7%)	17 (8.3%)	206 (49.8%)	<b>0.006</b>
Private pharmacy	172 (82.7%)	36 (17.3%)	208 (50.2%)	
<b>Telepharmacy application</b>				
Yes	315 (87.7%)	44 (12.3%)	359 (85.7%)	0.396

No	46 (83.6%)	9 (16.4%)	55 (13.3%)	
<b>Knowledge</b>				
Good	243 (94.2%)	15 (5.8%)	258 (62.3%)	<b>&lt;0.001</b>
Poor	118 (75.6%)	38 (24.4%)	156 (37.7%)	
<b>Attitude</b>				
Good	293 (95.4%)	14 (4.6%)	307 (74.2%)	<b>&lt;0.001</b>
Poor	68 (63.6%)	39 (36.4%)	107 (25.8%)	
<b>Behavior</b>				
Good	239 (98.4%)	4 (1.6%)	243 (58.7%)	<b>&lt;0.001</b>
Poor	122 (71.3%)	49 (28.7%)	171 (41.3%)	
<b>Telepharmacy investment payout</b>				
< 100,000	197 (84.5%)	36 (15.5%)	233 (56.3%)	0.104
100,000-500,000	117 (90.7%)	12 (9.3%)	129 (31.2%)	
500-1,000,000	30 (96.8%)	1 (3.2%)	31 (7.5%)	
> 1,000,000	17 (81.0%)	4 (19.05)	21 (5.1%)	

455 *Note: \* Chi square test.*

456

457 **Table 4. The logistic multivariate regression model tests some factors related to the**  
458 **level of readiness of Telepharmacy (n=414)**

Characteristic	Level of readiness		
		OR (95% CI)	P-value
<b>Workplace</b>	Private pharmacy	1	0.073
	Hospital pharmacy	1.94 (0.94 – 3.99)	
<b>Knowledge</b>	Poor	1	0.022
	Good	2.38 (1.14 – 4.99)	
<b>Attitude</b>	Poor	1	<b>&lt;0.001</b>

	Good	4.67 (2.26 – 9.66)	
<b>Behavior</b>	Poor	1	<b>&lt;0.001</b>
	Good	11.34 (3.84 – 33.45)	

459

460 **APPENDIX**

461 **Table APP.1. Cronbach's Alpha results and variables of the knowledge scale**

<b>Variable Name</b>	<b>Content</b>	<b>Cronbach's alpha</b>
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	

<b>Variable Name</b>	<b>Content</b>	<b>Cronbach's alpha</b>
K11	Telepharmacy can assist in many routine activities of pharmacists	

462

463 **Table APP.2. Cronbach's Alpha results and variables of the attitude scale**

<b>Variable Name</b>	<b>Content</b>	<b>Cronbach's alpha</b>
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	

464

465 **Table APP.3. Cronbach's Alpha results and variables of the practice scale**

<b>Variable Name</b>	<b>Content</b>	<b>Cronbach's alpha</b>
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	

<b>Variable Name</b>	<b>Content</b>	<b>Cronbach's alpha</b>
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	