

# Telepharmacy Implementation to Support Pharmaceutical Care Services during the COVID-19 Pandemic: A Scoping Review

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# 1 Telepharmacy Implementation to Support Pharmaceutical Care Services during the COVID-19 Pandemic: A Scoping Review

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## ABSTRACT

**Background:** Telepharmacy was effectively applied for remote pharmaceutical care during the COVID-19 pandemic.

**Objectives:** To determine the implementation of telepharmacy services to support pharmacists in providing pharmaceutical care during the pandemic.

**Data Sources:** Seven electronic databases were searched from inception (5 June 2021: PubMed, Ovid MEDLINE, Excerpta Medica database (Embase), Web of Science, Proquest, Scopus, and the Cochrane Database of Systematic Reviews.

**Study Selection and Data Extraction:** The review followed PRISMA guidelines and was registered with the PROSPERO registry of systematic reviews. Reports of original research investigating the implementation of telepharmacy during the COVID-19 pandemic were retrieved. Researchers screened the title and abstract of each article, and then evaluated the full text of eligible articles to identify studies that met the inclusion criteria. Pharmacists' responsibilities and actions were classified in relation to the International Pharmaceutical Federation guideline for managing the COVID-19 pandemic. Extracted data included study characteristics, pharmacists' interventions delivered through a telepharmacy system, and the benefits of telepharmacy implementation.

**Data Synthesis:** The database search yielded 1400 articles. After removal of duplicates and articles not meeting the specific inclusion criteria ( $n = 1381$ ), a total of 19 relevant original research articles were reviewed. According to these studies, telepharmacy was used to perform remote medication review and optimization, assess medication adherence, dispense and deliver medications, educate and counsel patients, promote disease prevention, collaborate with health care providers, and monitor treatment outcomes.

**Conclusions:** This study highlighted the use of telepharmacy services to support pharmacists' activities during the COVID-19 pandemic. Randomized clinical trials are needed to investigate the long-term efficacy and cost-effectiveness of telepharmacy services.

**Keywords:** telepharmacy, telemedicine, pharmacist, hospital pharmacy, COVID-19

## RÉSUMÉ

**Contexte :** La télépharmacie a été efficacement utilisée pour les soins pharmaceutiques à distance pendant la pandémie de COVID-19.

**Objectifs :** Déterminer comment des services de télépharmacie ont été mis en place pour soutenir les pharmaciens dans la prestation de leurs soins.

**Sources des données :** Sept bases de données électroniques ont été utilisées pour effectuer les recherches, pour la période allant du début jusqu'à juin 2021 : PubMed, Ovid MEDLINE, Excerpta Medica (Embase), Web of Science, Proquest, Scopus et la Cochrane Database of Systematic Reviews.

**Action des études et extraction des données :** L'examen suivait les lignes directrices PRISMA et a été enregistré dans le registre PROSPERO des revues systématiques. Des articles rapportant des recherches originales sur la mise en œuvre de la télépharmacie pendant la pandémie de COVID-19 ont été extraits. Les chercheurs ont examiné le titre et le résumé de chaque article avant d'évaluer le texte intégral des articles admissibles pour identifier les études répondant aux critères d'inclusion. Les responsabilités et les actes des pharmaciens ont été classés selon les lignes directrices de la Fédération internationale pharmaceutique relativement à la gestion de la pandémie de COVID-19. Les données extraites comprenaient les caractéristiques de l'étude, les interventions des pharmaciens effectuées au moyen du système de télépharmacie ainsi que les avantages de la mise en œuvre de la télépharmacie.

**Synthèse des données :** La recherche dans la base de données a rendu 1400 articles. Après suppression des doublons et des articles ne répondant pas strictement aux critères d'inclusion ( $n = 1381$ ), 19 articles de recherche originaux pertinents ont été examinés. Selon ces études, la télépharmacie était utilisée pour effectuer l'examen à distance de médicaments et leur optimisation, évaluer l'observance de la médication, dispenser et administrer des médicaments, informer et conseiller les patients, promouvoir la prévention des maladies, collaborer avec les prestataires de soins de santé et surveiller les résultats du traitement.

**Conclusions :** Cette étude a mis en évidence l'utilisation des services de télépharmacie pour soutenir les activités des pharmaciens pendant la pandémie de COVID-19. Des essais cliniques randomisés sont nécessaires pour étudier l'efficacité à long terme et la rentabilité des services de télépharmacie.

**Mots-clés :** télépharmacie, télé-médecine, pharmacien, pharmacie hospitalière, COVID-19

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## INTRODUCTION

Infections with SARS-CoV-2, causing COVID-19, have spread rapidly worldwide, posing a significant public health challenge. To combat this disease, many countries have developed and implemented important strategies for prevention, preparedness,<sup>1</sup> and recovery.<sup>2</sup> Health care professionals have been on the front lines fighting against this virus, while millions of individuals adhered to physical distancing and self-quarantine policies to reduce the risk of viral transmission.<sup>3</sup> Pharmacists have played a critical role in these efforts, by dispensing medications, providing information related to prevention and treatment, and monitoring health status and adverse events, as well as managing drug shortages.<sup>4</sup> However, when physical distancing and self-quarantine policies were broadly announced, patients were unable to visit the pharmacy.<sup>5</sup> Therefore, effective technologies were needed to replace face-to-face interactions for patient care during the pandemic.

As COVID-19 spread around the world, many national and international guidelines and expert<sup>33</sup> advisors recommended various pharmacy practices.<sup>6-8</sup> For instance, the International Pharmaceutical Federation (FIP) developed recommendations to ensure the continuity of supply of medicines and pharmaceutical devices.<sup>6</sup> In some countries, such as France and Portugal, pharmacists were authorized to prescribe medications, including refills and dispensing of medications<sup>23</sup> prescribed for individuals with chronic conditions.<sup>9-11</sup> In the United States, pharmacists were permitted to order<sup>16</sup> deliver COVID-19 rapid tests and vaccines.<sup>8,12</sup> The US Federal Retail Pharmacy Program for COVID-19 Vaccination<sup>69</sup> was established to facilitate collaborative efforts between the federal<sup>16</sup> government and national pharmacy partners, as well as independent pharmacy networks, to expand access to the vaccine across the country.<sup>1,12</sup> In Canada, the Ontario government allowed the prescription of antiviral treatment (nirmatrelvir-ritonavir [Paxlovid]) for the infection, and starting in December 2022, pharmacists have been able to prescribe nirmatrelvir-ritonavir to eligible individuals in person or by telephone at no cost.<sup>13</sup> By expanding the scope of practice for pharmacists, various governments have allowed access to health care for the most vulnerable, with the aim of reducing COVID-19-related hospitalization and morbidity.<sup>14</sup>

The COVID-19 pandemic has necessitated a rapid shift from traditional to telehealth care. With physical distancing in place, patients in need of counselling, therapeutic monitoring, and follow-up have faced challenges in making appointments for direct consultation. Therefore, digital technology has proven a helpful solution for both pharmacists and patients. Telepharmacy, one component of telehealth care, refers to the use of telecommunication technology to deliver pharmaceutical care.<sup>14,15</sup> It has been used for medication reconciliation, medication review and dispensing,

compounding and medication delivery,<sup>16</sup> patient counselling and education, and drug monitoring.<sup>15,17</sup> In the US, this technology enables pharmacists to review prescriptions and supervise pharmacy activities by videophone, while the process of medication dispensing is efficiently performed by a pharmacy technician at the remote site.<sup>18</sup> Canada, pharmacists in some jurisdictions are allowed to provide and bill for certain virtual services, such as virtual care for oncology patients.<sup>19</sup> In some European countries, such as the Netherlands, pharmacists have used guidelines from the national pharmacist association to implement remote consultations with patients (by video call, telephone, and email). Pharmacists in the United Kingdom used an online record-keeping platform to provide virtual consultations and fulfil requests for medication delivery.<sup>8,11</sup>

Because of the reduction in in-person interactions during the pandemic, relationships between pharmacists and patients have changed. The increased use of telepharmacy can facilitate continuous care and decrease the COVID-19 burden both during and after the pandemic. However, the use of digital care modalities presents numerous challenges that require innovative solutions, such as a lack of technology infrastructure and equipment, users' perceptions and attitudes, and the need for promotion and advertising.<sup>20</sup>

The accelerated growth of telemedicine worldwide has brought insight and a chance to advance clinical practice. Canada and the US have been reported as 2 of the top 5 countries with the highest production of telemedicine-related publications, confirming these countries as leaders in telemedicine research.<sup>21</sup> However, research about the use of telepharmacy during the pandemic is still limited. Exploring telepharmacy use is essential for pharmacists, researchers, institutions, funding agencies, stakeholders, and policy-makers to evaluate the clinical implementation of this modality, which may require investments in infrastructure. Therefore, we performed a scoping review to investigate the use of this technology to support pharmacists in providing pharmaceutical care during the pandemic. The specific objectives were to describe the use of telepharmacy in implementing pharmaceutical care across various countries, to identify the tools employed for telepharmacy and the benefits of implementing the technology, and to propose a telepharmacy model. Finally, it was anticipated that the scope of successful telepharmacy implementation during COVID-19 might suggest an insightful strategy for the provision of digital pharmaceutical care services in the next pandemic.

## METHODS

### Study Design

For this study, we applied the guidance of Arksey and O'Malley on conducting a systematic review,<sup>22</sup> and we followed the recommendations of the Preferred Reporting Items for



Systematic Reviews and Meta-Analyses (PRISMA) extension for scoping reviews.<sup>23</sup> The study protocol was developed and registered under the guidelines of the International Prospective Register of Systematic Reviews (PROSPERO) (registration ID: CRD42020199000).

In March 2020, the World Health Organization (WHO) declared COVID-19 to be a pandemic. For the purposes of this scoping review, we sought articles discussing the actions and responses of pharmacists over the period from 2020 to 2022. More specifically, on June 6, 2021, 2 researchers (M.A.S., I.W.S.) searched several electronic literature databases, specifically PubMed, Ovid MEDLINE, Excerpta Medica database (Embase), Proquest, Web of Science, Scopus, and the Cochrane Database of Systematic Reviews, to identify relevant studies published in English; an additional search of PubMed was conducted later to capture studies published in 2022. Searches were also based on the following medical subject heading (MeSH) terms and text words appearing in article titles or abstracts: “telemedicine” [Title/Abstract] OR “telemedicine” [MeSH Terms] OR “telemonitoring” [Title/Abstract] OR “telehealth” [Title/Abstract] OR “teleconsultation” [Title/Abstract] OR “telepharmacy” [Title/Abstract]. The search strategy was developed in consultation with a university librarian and is available by request to the corresponding author.

### Eligibility Criteria

The search for relevant articles was conducted according to the PICO format (Participants, Interventions, Comparators, Outcomes). The participants were patients of any age (adults or children), and the intervention was telepharmacy implementation. The comparators were usual care or non-telepharmacy implementation, and the outcomes were the benefits of implementing telepharmacy. Eligible studies were peer-reviewed, published reports of original research involving pharmacists who used telemedicine services to provide pharmaceutical care in hospitals during the COVID-19 pandemic.

The following publication types were excluded: letters to the editor, commentaries, short communications, current opinions, reviews, full-text articles in languages other than English, reports of telemedicine use by other health care professionals (nonpharmacists), and clinical trial protocols.

### Study Selection and Data Extraction

The studies were screened independently by 2 researchers (M.A.S., I.W.S.) to identify those meeting the eligibility criteria. Irrelevant articles that did not involve pharmacists and those describing interventions that had been implemented before the pandemic were excluded. For each potentially eligible article, the title and abstract, followed by the full text, were screened. To ensure a broad range of target studies, there were no restrictions on race, ethnicity, income, or gender of participants, nor were there any geographic

restrictions. The 2 researchers completed data extraction for each study independently, describing the authors, countries, clinical settings, study designs, tools/components used for telepharmacy, pharmacists' interventions delivered through telepharmacy, and benefits of telepharmacy implementation. Descriptive information collected for analysis focused on how pharmacists delivered services using the telepharmacy system. To gain further insights and experiences regarding implementation of pharmaceutical services during the pandemic, a hospital pharmacist with a minimum of 2 years' experience was invited as a third reviewer to discuss the implementation of telepharmacy within each study. Disagreements about study selection and data extraction were resolved by discussion and consensus.

### Pharmacy Practice and Activities Using Telepharmacy Systems

Pharmacists' activities during the COVID-19 pandemic were classified according to the FIP pharmacy guidelines for managing the pandemic.<sup>24</sup> Pharmacy practices during the pandemic were categorized using the criteria proposed by Watson and others,<sup>25</sup> specifically, prevention, preparedness, response, and recovery. Prevention and preparedness involve immediate actions to reduce the health risks associated with transmission of SARS-CoV-2, such as medication supplies, masks and other personnel protective equipment, and new workflow strategies.<sup>26</sup> The response encompasses pharmaceutical actions taken to minimize face-to-face interactions for processes such as medication reviews, home delivery, and sterile compounding. Recovery involves actions taken to return to normal activities after the pandemic.<sup>25</sup> The FIP guideline addressed several issues, including ensuring an adequate supply of medications, supporting continuity of treatment and long-term care, ensuring patient safety related to sterile compounded chemotherapy agents, collaborating with other health care providers in providing psychological support, referring to prescribers, informing and educating the public about COVID-19, and promoting infection prevention and control in the hospital setting.<sup>6</sup>

### Benefits of Telepharmacy Implementation

The benefits of telepharmacy implementation were classified according to the 5 dimensions of the Alberta Quality Index for Health, as used in a previous scoping review<sup>15</sup>: acceptability, accessibility, effectiveness, efficiency, and safety. Acceptability pertains to the successful adoption of telepharmacy by its users, namely pharmacists and patients. This characteristic can be represented as patient satisfaction and willingness to use the technology over time. Accessibility is defined as the ease with which pharmaceutical care can be delivered or received through the telepharmacy system. Effectiveness focuses on strategies for providing pharmacy services to achieve the specified benefits. Efficiency

refers to the design of telepharmacy implementation and the extent to which it optimizes workflow. Safety addresses any concerns associated with the use of telepharmacy, including the safety of patients and health care personnel.

### Assessment of Study Quality

We assessed the quality of observational descriptive studies using the MINCIr initiative checklist.<sup>27</sup> The 4 main domains assessed were introduction (study problem and objectives), methodology (design, setting, participants, eligibility, sampling, variables, follow-up, statistics, and ethics), results (description and analysis of groups), and discussion (novelty, comments, limitations, and conclusion). Two researchers (M.A.S., M.K.A.J.) independently assessed the quality of each included study and presented the results in a tabular format for ease of visual interpretation.

## RESULTS

### Study Characteristics

The initial search yielded 1459 articles, representing 1042 unique studies following removal of duplicates. After screening of titles and abstracts, 748 full-text articles were assessed, of which 19 studies were deemed eligible for inclusion in the scoping review. The reasons for exclusion are detailed in the PRISMA flowchart<sup>23</sup> (Figure 1), and

the characteristics of the included studies are presented in Table 1.<sup>28-46</sup> The included articles were classified in terms of the country where each study took place, the clinical setting, and the study design.

### Geographic Settings and Study Design

The included studies were conducted in the following countries: United States<sup>28-32</sup>; United Arab Emirates, Saudi Arabia, and Egypt<sup>33-37,46</sup>; Spain<sup>38-41</sup>; China<sup>42,43</sup>; the Philippines<sup>44</sup>; and the Republic of Srpska, Bosnia, and Herzegovina.<sup>45</sup> Most of the studies had a cross-sectional design (see Table 1). Across these studies, telepharmacy was usually implemented for remote performance of medication review, dispensing, counselling, and monitoring of patients' health status.

### Settings and Participants

Telepharmacy services were delivered in both community and hospital pharmacies. For example, this technology allowed pharmacists to provide virtual consultation in an oncology clinic,<sup>35</sup> to conduct virtual medication tours in a cystic fibrosis clinic,<sup>32</sup> to perform therapeutic drug monitoring of warfarin utilization in an anticoagulation clinic,<sup>46</sup> to accomplish dosage titration for patients receiving medication for opioid use disorder,<sup>29</sup> and to deliver medications to patients with HIV infection.<sup>40</sup>

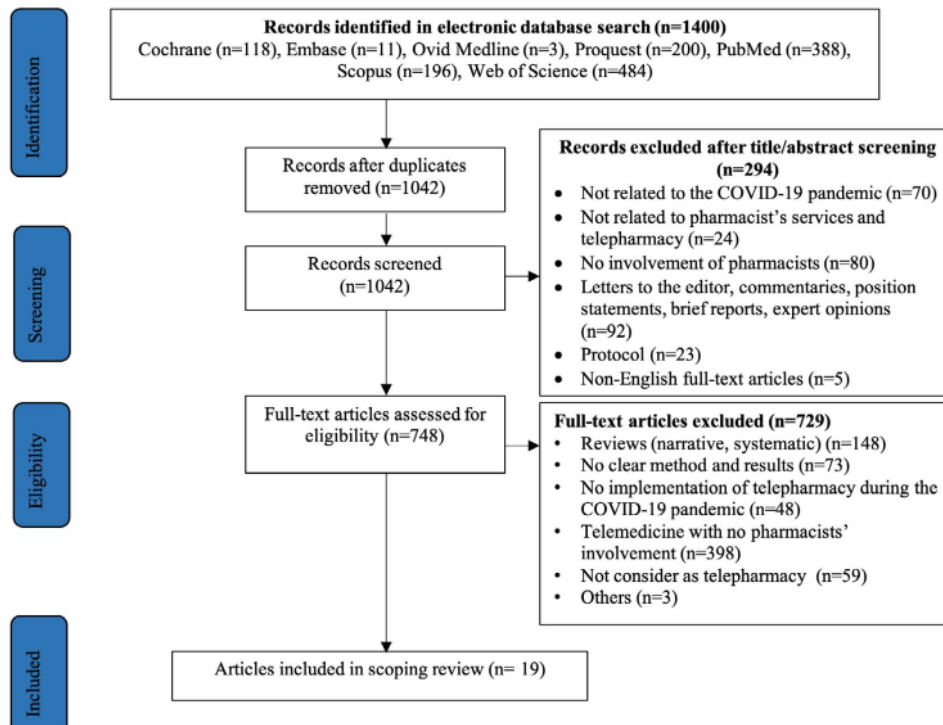


FIGURE 1. PRISMA flow chart.

TABLE 1 (Part 1 of 3). Overview of Telepharmacy Services (n = 19)

Reference	Country	Setting	Study Design	Pharmacist Intervention Delivered by Telepharmacy	Components and Tools of Telepharmacy	Outcomes
Al Ammari et al. <sup>46</sup>	Saudi Arabia	Anticoagulation clinic in a tertiary care hospital	Cross-sectional	<ul style="list-style-type: none"> <li>• Anticoagulation management</li> </ul>	<ul style="list-style-type: none"> <li>• Telephone</li> <li>• Chat application</li> <li>• Hospital electronic system</li> </ul>	<ul style="list-style-type: none"> <li>• Cost-effectiveness and efficiency of telepharmacy model, patient satisfaction</li> <li>• Telepharmacy was as effective as face-to-face consultations <sup>18</sup></li> <li>• Good control of anticoagulant use in &gt; 50% of patients</li> </ul>
Al Mazrouei et al. <sup>34</sup>	United Arab Emirates	Community pharmacies	Cross-sectional	<ul style="list-style-type: none"> <li>• Remote consultation</li> <li>• Remote prescription refills</li> <li>• Medication delivery</li> <li>• Medication review</li> <li>• Medication dispensing</li> </ul>	<ul style="list-style-type: none"> <li>• Videoconference system</li> <li>• Telephone</li> <li>• EHR</li> <li>• Website and social media</li> </ul>	<ul style="list-style-type: none"> <li>• Telepharmacy significantly reduced potential abuse or misuse of OTC medicines</li> <li>• Telepharmacy was accessed more often by older adults and vulnerable patients than by younger patients</li> <li>• Telepharmacy helped pharmacists to identify the most common OTC medicines with abuse or misuse potential <sup>46</sup></li> </ul>
Al Meslamani et al. <sup>36</sup>	Egypt	Hospitals	Cross-sectional	<ul style="list-style-type: none"> <li>• Medication review</li> <li>• Resolution of medication-related problems</li> <li>• Medication dispensing</li> <li>• Patient counselling</li> </ul>	<ul style="list-style-type: none"> <li>• Telephone</li> <li>• Mobile application</li> </ul>	<ul style="list-style-type: none"> <li>• Telepharmacy showed improvement in clinical outcomes, including substitution of a prescribed medication, medication optimization, medication-related advice, and advice to discontinue the therapy</li> <li>• Remote consultation had significant impact on both medicine use and clinical outcomes of COVID-19 patients <sup>13</sup></li> </ul>
Alshamrani et al. <sup>35</sup>	Saudi Arabia	Oncology clinic	Qualitative study	<ul style="list-style-type: none"> <li>• Virtual oncology consultation</li> <li>• On-call telephone services</li> </ul>	<ul style="list-style-type: none"> <li>• Telephone</li> </ul>	<ul style="list-style-type: none"> <li>• Development of 8 recommendations related to building telemedicine cancer care and mitigating the effect of COVID-19</li> </ul>
Asseri et al. <sup>37</sup>	Saudi Arabia	University hospital	Cross-sectional	<ul style="list-style-type: none"> <li>• Medication review</li> <li>• Medication delivery</li> <li>• Online prescription refills</li> <li>• Virtual counselling</li> </ul>	<ul style="list-style-type: none"> <li>• Website</li> <li>• Chat application</li> </ul>	<ul style="list-style-type: none"> <li>• Pharmacy staffing protection</li> <li>• Increase in pharmacy's capacity and capability to meet inpatient and outpatient needs</li> <li>• Efficiency and effectiveness of integrated medication management system</li> </ul>
Bautista et al. <sup>28</sup>	United States	University	Cross-sectional	<ul style="list-style-type: none"> <li>• Medication review</li> <li>• Mental health screening and treatment</li> <li>• Interprofessional communication</li> </ul>	<ul style="list-style-type: none"> <li>• Videoconference system</li> <li>• Mobile application</li> <li>• Telephone</li> </ul>	<ul style="list-style-type: none"> <li>• Increase in students' confidence, knowledge, and communication skills through interprofessional rotation</li> </ul>
Castillo et al. <sup>29</sup>	United States	Free, student-run community service clinic in an academic medical centre	Cross-sectional	<ul style="list-style-type: none"> <li>• Virtual clinic appointments</li> <li>• Prescription requests</li> <li>• Patient interview and assessment for substance use disorder</li> <li>• Dosage titration</li> <li>• Craving management</li> <li>• Therapeutic and side effect monitoring</li> <li>• Medication dispensing</li> <li>• Patient counselling for patients who received medication for opioid use disorder</li> </ul>	<ul style="list-style-type: none"> <li>• Videoconference system</li> <li>• EHR</li> <li>• Telephone</li> <li>• Online form</li> <li>• Social media</li> </ul>	<ul style="list-style-type: none"> <li>• Telepharmacy was as effective as face-to-face consultation <sup>15</sup></li> <li>• Telepharmacy was used to practice harm reduction</li> <li>• Telepharmacy was convenient and user-friendly for physicians, students, and patients</li> </ul>

TABLE 1 (Part 2 of 3). Overview of Telepharmacy Services (n = 19)

Reference	Country	Setting	Study Design	Pharmacist Intervention Delivered by Telepharmacy	Components and Tools of Telepharmacy	Outcomes
Hron et al. <sup>30</sup>	United States	Academic medical centre	Cross-sectional	<ul style="list-style-type: none"> <li>Intrahospital inpatient telehealth system involving physicians, nurses, and clinical informaticians</li> <li>Meeting initiation with patient-specific password</li> <li>Patient counselling</li> </ul>	<ul style="list-style-type: none"> <li>Videoconference system</li> <li>Telephone</li> <li>Email</li> <li>Tablet with personal login access and meeting link with QR codes</li> </ul>	<ul style="list-style-type: none"> <li>Telehealth effectively supported clinician communication and workflow</li> </ul>
Ibrahim et al. <sup>33</sup>	United Arab Emirates <sup>2</sup>	Community pharmacies	Cross-sectional	<ul style="list-style-type: none"> <li>Medication dispensing error identification</li> <li>Prescription-related error identification</li> <li>Patient counselling</li> <li>On-site pharmacist system</li> <li>Medication delivery</li> </ul>	<ul style="list-style-type: none"> <li>Secure web access</li> <li>Cloud and social media</li> <li>Secure fax</li> <li>Videoconference system</li> </ul>	<ul style="list-style-type: none"> <li>Community pharmacies effectively delivered pharmaceutical services related to COVID-19 management</li> <li>Community pharmacies had a lower incidence of medication dispensing errors<sup>2</sup></li> <li>Telepharmacy empowered pharmacists to act as independent prescribers</li> </ul>
Kovacević et al. <sup>45</sup>	Republic of Srpska, Bosnia, and Herzegovina	Community pharmacy	Cross-sectional	<ul style="list-style-type: none"> <li>Drug information service related to COVID-19</li> <li>Medication recommendations</li> <li>Identification of drug-related problems</li> <li>Patient counselling</li> <li>Medication review</li> <li>Drug interaction screening</li> <li>Health promotion</li> <li>Patient referral system</li> </ul>	<ul style="list-style-type: none"> <li>Telephone</li> </ul>	<ul style="list-style-type: none"> <li>Telepharmacy helped pharmacists to provide consultations for patients with chronic diseases</li> <li>Telepharmacy was a convenient model during the pandemic</li> </ul>
Li et al. <sup>42</sup>	China	Tertiary care hospitals, including shelter hospitals	Literature review	<ul style="list-style-type: none"> <li>Medication reconciliation</li> <li>Medication order review and optimization</li> <li>Patient counselling and drug information service</li> <li>Multimedia health education</li> <li>Therapeutic monitoring</li> <li>Inpatient prescription review</li> <li>Medication dispensing</li> </ul>	<ul style="list-style-type: none"> <li>Mobile application</li> <li>Social media</li> <li>Telephone</li> <li>Videoconference system</li> <li>Website and cloud platform</li> <li>Radio station</li> </ul>	<ul style="list-style-type: none"> <li>Telepharmacy supported pharmacists to deliver information regarding COVID-19 and decreased patients' anxiety</li> <li>Telepharmacy improved the efficiency of pharmacy services and decreased the risk of virus transmission</li> </ul>
Margusino-Framiñan et al. <sup>39</sup>	Spain	Outpatient hospital pharmacy	Cross-sectional	<ul style="list-style-type: none"> <li>Medication dispensing</li> <li>Medication delivery</li> <li>Patient counselling</li> <li>Remote consultation</li> <li>Remote monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Videoconference system</li> <li>Telephone</li> </ul>	<ul style="list-style-type: none"> <li>Telepharmacy was successfully coordinated between primary care pharmacist and community pharmacist</li> <li>Patients' satisfaction was very high</li> <li>Home delivery service reached 100%</li> </ul>
McNamara et al. <sup>31</sup> <sup>1</sup>	United States	Primary care clinics <sup>2</sup>	Cross-sectional	<ul style="list-style-type: none"> <li>Comprehensive medication management</li> <li>Medication prescription</li> <li>Resolution of medication-related problems</li> <li>Medication titration</li> <li>Medication monitoring</li> <li>Medication adherence</li> </ul>	<ul style="list-style-type: none"> <li>Telephone</li> <li>Video</li> </ul>	<ul style="list-style-type: none"> <li>Telepharmacy was effective in resolving medication-related problems</li> </ul>



TABLE 1 (Part 3 of 3). Overview of Telepharmacy Services (n = 19)

Reference	Country	Setting	Study Design	Pharmacist Intervention Delivered by Telepharmacy	Components and Tools of Telepharmacy	Outcomes
Peláez-Bejano et al. <sup>38</sup>	Spain	Hospital and community pharmacists	Cross-sectional	<ul style="list-style-type: none"> <li>Medication review</li> <li>Medication optimization and problem resolution</li> <li>Medication dispensing</li> <li>Medication delivery</li> <li>Patient counselling</li> </ul>	<ul style="list-style-type: none"> <li>Telephone</li> <li>EHR</li> </ul>	<ul style="list-style-type: none"> <li>Delivery of medications to patients using a circuit delivery service involving community pharmacy, college of pharmacy, hospital pharmacy, and pharmaceutical cooperative</li> <li>Patients were satisfied and responded positively to using the delivery service</li> </ul>
Plantado et al. <sup>44</sup>	Philippines	Community	Cross-sectional	<ul style="list-style-type: none"> <li>Medication information service and resolution of drug-related queries</li> </ul>	<ul style="list-style-type: none"> <li>Social media</li> <li>Online form</li> <li>Email</li> <li>Telephone</li> </ul>	<ul style="list-style-type: none"> <li>Telepharmacy helped pharmacists to answer drug-related queries, including questions about indication, adverse drug reactions, and drug-drug interactions</li> <li>People found use of telepharmacy services was convenient</li> </ul>
Quirós-González et al. <sup>40</sup>	Spain	HIV unit in a university hospital	Pre-post intervention	<ul style="list-style-type: none"> <li>Medication dispensing</li> <li>Medication delivery</li> <li>Patient consultation</li> </ul>	<ul style="list-style-type: none"> <li>Telephone</li> <li>EHR</li> </ul>	<ul style="list-style-type: none"> <li>Telepharmacy was effective in dispensing, providing consultations, and delivering antiretroviral drugs to ambulatory HIV patients based on viral load, emergency care, CD4 level, and hospitalization</li> </ul>
Tortajada-Goitia et al. <sup>2</sup>	Spain	Hospital pharmacies	Cross-sectional	<ul style="list-style-type: none"> <li>Medication dispensing</li> <li>Medication delivery</li> <li>Medication monitoring</li> <li>Coordination with community pharmacies and primary care outpatient clinics</li> </ul>	<ul style="list-style-type: none"> <li>Telephone</li> <li>Intrahospital system</li> </ul>	<ul style="list-style-type: none"> <li>The most frequently requested services were home dispensing and medication delivery</li> </ul>
Wang et al. <sup>43</sup>	China	Tertiary care hospital	Cross-sectional	<ul style="list-style-type: none"> <li>Resolution of drug-related problems</li> <li>Medication review</li> <li>Remote consultation</li> <li>Patient education and psychological support</li> <li>Medication reconciliation</li> <li>Monitoring of adverse drug effects</li> </ul>	<ul style="list-style-type: none"> <li>Telephone</li> <li>Mobile application</li> <li>Radio station</li> </ul>	<ul style="list-style-type: none"> <li>Telepharmacy helped pharmacists to identify and resolve drug-related problems, as well as to determine drug usage, discuss precautions, perform reconciliation, identify adverse drug reactions, and provide psychological counselling</li> <li>Patients expressed satisfaction with telepharmacy services</li> </ul>
Warda et al. <sup>32</sup>	United States	Cystic fibrosis clinic	Cross-sectional	<ul style="list-style-type: none"> <li>Virtual medication tours</li> <li>Medication history reconciliation</li> <li>Medication adherence assessment</li> <li>Identification of adverse effects</li> <li>Collaborative work</li> <li>Medication storage evaluation</li> </ul>	<ul style="list-style-type: none"> <li>Telephone</li> <li>Video</li> <li>Web camera</li> <li>Web-based software</li> </ul>	<ul style="list-style-type: none"> <li>Most patients were properly storing medications</li> <li>Virtual medication tour was successfully incorporated into telehealth visits</li> <li>Most patients were satisfied with telepharmacy services</li> </ul>

EHR = electronic health record, OTC = over the counter.



### Components of Telepharmacy

Figure 2 presents the components of telepharmacy across all studies, including websites, cloud-based services, telephone, facsimile, tablet with internet-based login access, mobile messenger application, electronic health records, videoconferencing systems, radio and live broadcast stations, interactive chat, and social media. Telepharmacy also facilitated consultations with patients and medication review between physicians and pharmacists through videoconferencing systems, fax, email, and telephone. Smartphones could be used to deliver virtual counselling to patients and to notify them about new medication therapy.

### Pharmacy Practice and Activities Using Telepharmacy Systems

Figure 3 presents the various activities delivered by pharmacists through a telepharmacy system, as documented in the included studies. Telepharmacy systems helped pharmacists to verify prescriptions, identify and resolve drug-related problems,<sup>31,36,38,43,45</sup> dispense and deliver medications,<sup>33,34,36,39,41,42</sup> reconcile medications,<sup>32,42,43</sup> assess medication adherence,<sup>32</sup> calculate and adjust doses,<sup>37,46</sup> monitor therapeutic and side effects,<sup>29,31,37,39,41-43</sup> monitor drug-drug interactions,<sup>45</sup> provide drug information services,<sup>44</sup> educate and counsel patients,<sup>28-30,32-37,39,41-43,45,46</sup> provide chronic disease monitoring,<sup>32,35,40</sup> and deliver psychological and well-being support.<sup>42,43</sup>

Pharmacists' activities are described in Table 2 in relation to the FIP guideline<sup>6</sup> and the 4 criteria for pharmacists' activities in disasters described by Watson and others.<sup>25</sup> In 6 studies, pharmacists provided IV admixture services with automated dispensing cabinets,<sup>34-38,42</sup> whereas in 12 other studies, pharmacists presented COVID-19-related education, in particular using posters,<sup>39</sup> classroom training,<sup>30</sup> social media,<sup>44</sup> and broadcast programs.<sup>42,43</sup> To promote infection control and prevention, 2 studies developed recommendations related to the pandemic,<sup>33,35</sup> and a third provided tablets and meeting links to the biocontainment team.<sup>30</sup>

### Benefits of Telepharmacy Implementation

As described in the subsections below, the benefits of telepharmacy implementation during the COVID-19 pandemic were classified in terms of accessibility, acceptability, effectiveness, efficiency, and safety. The challenges and solutions associated with these potential benefits are summarized in Table 3.

#### Accessibility

Using telephone conversations and electronic health records, pharmacists were able to review physicians' orders and dispense and deliver medications through circuit delivery services involving community pharmacies.<sup>38</sup> Patients were satisfied with this model and indicated that they would use the service again.<sup>38</sup> Telepharmacy was also found to be effective for dispensing and delivering antiretroviral agents

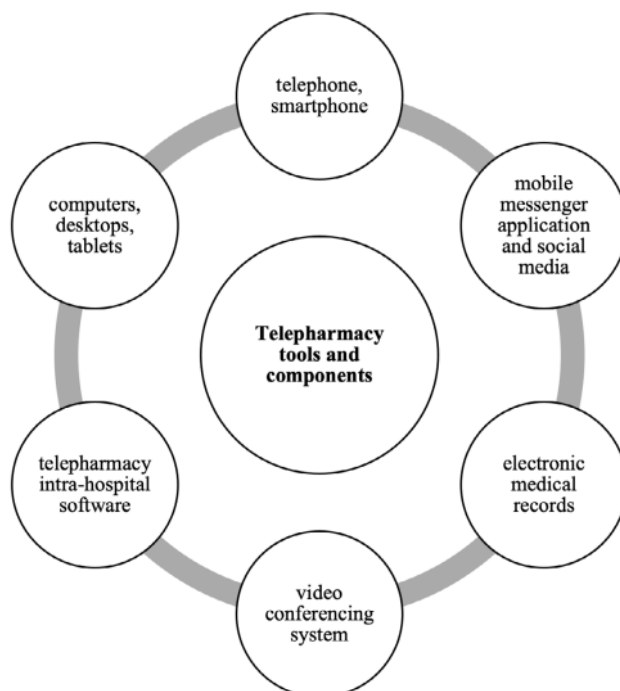


FIGURE 2. Components of the telepharmacy system.

to ambulatory HIV/AIDS patients.<sup>40</sup> It helped pharmacists to screen for mental health problems and to communicate effectively with other health care providers and students.<sup>29</sup> Videoconferencing with a mobile application and telephone allowed health care students to improve their confidence, knowledge, and communication skills.<sup>28</sup> Telepharmacy was also used to assess patients with potential substance use disorders and to facilitate communication between pharmacists and clinicians.<sup>30</sup>

### Acceptability

In a study from Spain, the most frequently used telepharmacy services were home dispensing and medication delivery.<sup>41</sup> Telepharmacy, primarily provided by the hospital through an online portal, allowed pharmacists to check drug interactions in a patient's prescriptions.<sup>37</sup> Three studies reported that patients found this system convenient.<sup>32,43,44</sup> However, another study showed that a virtual pharmacist service was more frequently accessed by older adults and vulnerable individuals than by younger patients.<sup>34</sup> The technology helped pharmacists to provide medication consultation for individuals with chronic diseases and was described as a convenient method.<sup>45</sup> Additionally, telepharmacy was used in assessing patients for substance use disorders and was determined to be convenient and user-friendly

for physicians and pharmacists.<sup>30</sup> One study reported that the technology increased home delivery services to 100%, generating high levels of patient satisfaction.<sup>39</sup>

### Effectiveness

Telepharmacy was used to ensure the continuity of care. Al Ammari and others<sup>46</sup> showed that it was employed for monitoring adherence to anticoagulant therapy. According to that study, 31% of patients had an international normalized ratio (INR) value within the therapeutic range. Telepharmacy was also discovered to be cost-effective and efficient.<sup>46</sup> Castillo and others<sup>29</sup> reported that the use of telephone and videoconferencing systems was effective and feasible in monitoring the therapeutic and side effects of prescribed buprenorphine. In another study, pharmacy students assisted patients in obtaining their medications from the pharmacy.<sup>29</sup> In some studies, virtual consultation by telepharmacy was just as effective as face-to-face consultation.<sup>29,46</sup> Activation of a virtual cancer outpatient system was successful in delivering 24-hour hotline consultations related to cancer treatments for individuals receiving oral chemotherapy.<sup>35</sup> Another study reported that pharmacists provided counselling sessions through an interactive video platform and were able to communicate with physicians using a social media chat application.<sup>37</sup>

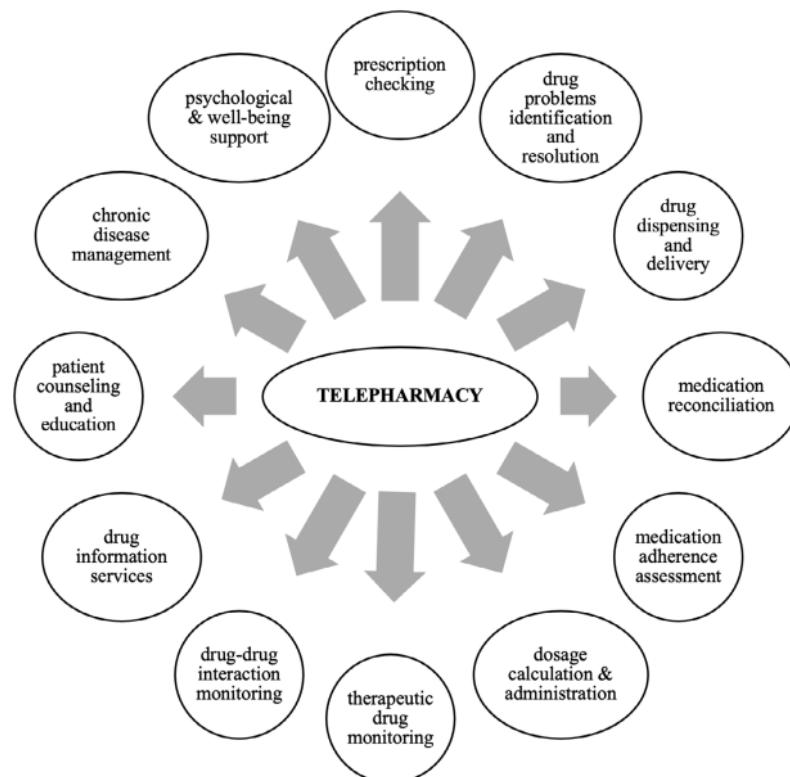


FIGURE 3. Pharmacists' actions delivered through the telepharmacy system.

**TABLE 2 (Part 1 of 3). Activities of Pharmacists Using Telepharmacy System during the COVID-19 Pandemic**

Reference	Prevention and Preparedness			Response		Recovery		
	Ensuring Adequate Procurement, Storage, and Supply	Supporting Continuity of Treatments	Ensuring Patient Safety Related To Compounded Sterile Preparations	Counselling	Referral	Collaborating with Other Health Care Professionals	Informing and Educating the Public	Promoting Disease Prevention and Infection Control
Al Amrani et al. <sup>46</sup>	Provide anticoagulant therapy	Adjust and optimize warfarin dose	NR	Provide medication consultation	NR	Collaborate with physicians	NR	NR
Al Mazrouei et al. <sup>34</sup>	Dispense medications	Provide remote prescription refills, medication review, and medication delivery	Provide automated medicine dispensing	Provide remote consultation	NR	Collaborate with physicians	Provide information about OTC medicines	NR
Al Meslamani et al. <sup>36</sup>	Dispense medications	Resolve medication-related problems, including substitution, initiation, and cessation of drug therapy	Provide automated dispensing cabinets	Provide medication counselling	Refer to physicians	Collaborate with physicians and nurses	Provide patient education about medication use	NR
Alshamrani et al. <sup>35</sup>	Provide medication supply	Participate in phone calls and videoconferences	Administer IV chemotherapy through elastomeric infusion pumps	Offer 24-hour hotline service	NR	Collaborate with health care personnel and oncology centre	Educate patients for at-home administration of medications	Develop recommendations for pharmacist's actions
Asseri et al. <sup>37</sup>	Purchase and supply chain management	Provide medication review, dose optimization, medication refill, and virtual monitoring	Provide IV admixtures	Provide virtual counselling	NR	Collaborate with physicians and nurses	NR	Provide automated dispensing cabinets
Bautista et al. <sup>28</sup>	NR	NR	NR	Provide medication counselling	NR	Collaborate with medical students	Review and record material on COVID-19	NR
Castillo et al. <sup>29</sup>	Synchronize electronic prescribing in the pharmacy system	Provide virtual appointments	NR	Counsel patients on the logistics of buprenorphine	NR	Collaborate with medical students and physicians	NR	NR
Hron et al. <sup>30</sup>	Telepharmacy rounds for primary inpatient teams	Provide videoconferences and QR codes	NR	Provide medication counselling	Provide teleconsultations for subspecialists	Collaborate with physicians and nurses	Develop educational materials and offer classroom training	Provide tablet and meeting link to biocontainment team
Ibrahim et al. <sup>33</sup>	Dispense medications	Deliver medications	NR	Provide remote consultation	NR	NR	Educate patients with chronic diseases	Provide COVID-19-related recommendations

**TABLE 2 (Part 2 of 3). Activities of Pharmacists Using Telepharmacy System during the COVID-19 Pandemic**

Reference	Prevention and Preparedness			Response		Recovery		
	Ensuring Adequate Procurement, Storage, and Supply	Supporting Continuity of Treatments	Ensuring Patient Safety Related To Compounded Sterile Preparations	Counselling	Referral	Collaborating with Other Health Care Professionals	Informing and Educating the Public	Promoting Disease Prevention and Infection Control
Kovačević et al. <sup>45</sup>	NR	Provide medication review	NR	Provide patient counselling for nonpharmacological actions, OTC drug recommendations, and dietary supplements	Refer to a physician for refill/prescribing purposes	Collaborate with physicians	Provide COVID-19-related information	NR
Li et al. <sup>42</sup>	Provide antiviral medication, remote review of inpatient orders; dispense medications	Provide prescription review	Provide IV medications using pharmacy IV admixture service	Provide medication, lifestyle guidance, and psychological counselling using cloud-based pharmacy care system	Refer to shelter hospitals	Collaborate with physicians	Provide COVID-19 lecture series, multimedia health education, live broadcast, and cloud-based pharmacy care	Provide pharmacy IV admixture services and intelligent storage cabinets
Margušino-Framiñán et al. <sup>39</sup>	Dispense medications	Provide medication delivery and monitoring	NR	Provide outpatient consultation	NR	Collaborate with primary care and community pharmacists	Provide information posters on personal hygiene and infection control	NR
McNamara et al. <sup>31</sup>	NR	Resolve medication-related problems, perform dosage titration, and monitor medication therapy	NR	NR	Refer to hospitals	Collaborate with physicians	NR	NR
Peláez Bejanaro et al. <sup>38</sup>	Pack medications in a black sealed bag with specific labels	Deliver medications	Check medication packages from hospital pharmacy	Reinforce medication information	Collect requests from all community pharmacies and forward by email to hospital pharmacy	Collaborate with college, community, hospital, and pharmaceutical cooperatives within circuit delivery service	NR	NR
Plantado et al. <sup>44</sup>	NR	NR	NR	NR	NR	Collaborate with pharmacists	Provide education about health information-seeking patterns	Promote infection control on social media and by email
Quirós-González et al. <sup>40</sup>	Provide antiretroviral agents	Deliver medications	NR	NR	NR	Collaborate with physicians	NR	NR



**TABLE 2 (Part 3 of 3). Activities of Pharmacists Using Telepharmacy System during the COVID-19 Pandemic**

Reference	Prevention and Preparedness			Response			Recovery		
	Ensuring Adequate Procurement, Storage, and Supply	Supporting Continuity of Treatments	Ensuring Patient Safety Related To Compounded Sterile Preparations	Counselling	Referral	Collaborating with Other Health Care Professionals	Informing and Educating the Public	Promoting Disease Prevention and Infection Control	
Tortajada-Goitia et al. <sup>41</sup>	Provide remote pharmaceutical care and dispense medications	Deliver medications	NR	Provide medication consultation	NR	NR	Provide information on pharmacotherapy	NR	
Wang et al. <sup>43</sup>	Adjust inventory with online system	Provide follow-up visits and deliver medications	NR	Provide medication consultation	NR	NR	Provide science broadcasting program	NR	
Warda et al. <sup>32</sup>	NR	Provide virtual medication tours, medication review, medication reconciliation; assess medication storage conditions	NR	Provide medication consultation	NR	Collaborate with physicians and nurses	NR	NR	

NR = not reported, OTC = over-the-counter.

**TABLE 3 (Part 1 of 2). Benefits, Challenges, and Solutions Related to Telepharmacy Implementation**

Benefit and Study	Purpose	Challenges and Solutions
<b>Accessibility</b>		
Bautista et al. <sup>28</sup>	Design a model of telehealth involving interprofessional rotation of pharmacy and medical students	Challenges: Limited capability to assess patients; communication and technological issues Solution: Provide comprehensive and continuous training for students
Peláez Bejanaro et al. <sup>38</sup>	Design a telepharmacy model that increases access to hospital medication	Challenge: Requirement for active involvement of hospital and community pharmacies Solution: Develop an integrative communication procedure among hospital pharmacies, community pharmacies, patients, and pharmaceutical cooperative or delivery services
Quirós-González et al. <sup>40</sup>	Provide home medication delivery and online consultations for patients with HIV infection	Challenges: Patients' lack of adherence with therapy and infrequent drug monitoring Solution: Provide an integrative telepharmacy system with secure access that allows monitoring of outcomes
<b>Accessibility and effectiveness</b>		
Castillo et al. <sup>29</sup>	Develop a telepharmacy model for medications for opioid use disorder	Challenges: Technological issues; lack of availability of medications at patients' local pharmacies Solutions: Create efficient features, such as online appointments, social media for promotion, and virtual consultations; build partnerships and collaboration with nearby pharmacies; establish guidance and policies regarding telepharmacy services for the prescription of controlled substances
<b>Accessibility and efficiency</b>		
Li et al. <sup>42</sup>	Provide remote inpatient order review and dispensing system, online counselling, and multimedia health education	Challenges: Technological issues; pharmacists' inability to provide communication and lecture content Solutions: Establish procedures for review of dispensing of inpatient orders; create a website for the public; create a cloud-based pharmacy system, including mobile applications and social media; provide live broadcast or recorded course for health care providers and patients; provide continuous training for pharmacists
<b>Acceptability</b>		
12. Rajada-Goitia et al. <sup>41</sup>	Develop a telepharmacy system for outpatient care in a hospital pharmacy department	Challenges: Technological issues; lack of readiness of personnel, especially to deliver medications; reimbursement and payment for pharmacists' work Solutions: Develop a robust legal framework and regulation; consider a mixed pharmaceutical care model based on patients' needs; invest in human resources and build solid, collaborative teamwork
Plantado et al. <sup>44</sup>	Provide a free online telepharmacy service	Challenges: Technological issues; lack of readiness of personnel; communication barriers; reimbursement and payment for pharmacists' work Solutions: Develop a standard procedure for use of telepharmacy service with an excellent connection; increase investments in human resources; provide educational training for pharmacists and patients
Warda et al. <sup>32</sup>	Provide virtual medication tours	Challenges: Patients' lack of adherence to treatment and monitoring; technological issues; communication barriers Solutions: Plan a flexible schedule for telehealth visits; provide training for pharmacists and patients
Kovačević et al. <sup>45</sup>	Provide a remote telepharmacy system	Challenges: Technological issues; pharmacists' time and workload Solutions: Develop an efficient schedule of work shifts; provide training for pharmacists; build an integrative regulation for remote pharmaceutical services
Margusino-Framiñán et al. <sup>39</sup>	Design remote outpatient pharmacy consultations, including home delivery services and medical appointments	Challenges: Lack of readiness of personnel to deliver medications; technological issues; variability in information provided Solutions: Build solid coordination between hospital and community pharmacies; develop early planning by appointment; consider investments in human resources

**TABLE 3 (Part 2 of 2). Benefits, Challenges, and Solutions Related to Telepharmacy Implementation**

<b>Benefit and Study</b>	<b>Purpose</b>	<b>Challenges and Solutions</b>
<b>Acceptability and accessibility</b>		
Hron et al. <sup>30</sup>	Provide a videoconferencing system with a unique meeting link and password for each hospital bed	Challenge: Technological issues (secure access, data privacy, and signal connection) Solutions: Develop and establish telehealth system; provide training for health care providers; build solid multidisciplinary teamwork
<b>Acceptability and safety</b>		
Wang et al. <sup>43</sup>	Provide pharmaceutical care through telepharmacy system	Challenges: Technological issues; lack of readiness of personnel Solutions: Establish technology infrastructure; establish pharmacists' activities and workflow, including medication reconciliation, medication review and dispensing, and patient counselling
Al Mazrouei et al. <sup>34</sup>	Provide virtual pharmaceutical care on abuse of over-the-counter medications	Challenges: Lack of readiness of trained personnel; technological issues Solutions: Provide training for pharmacists; establish integrative procedures and regulations for the service
<b>Effectiveness</b>		
Al Ammari et al. <sup>46</sup>	Provide telepharmacy anticoagulation service	Challenge: Patients' lack of adherence to medication use and drug monitoring Solutions: Develop an effective telepharmacy model; provide a comprehensive anticoagulant management plan
<b>Effectiveness and safety</b>		
Alshamrani et al. <sup>35</sup>	Activate virtual communication	Challenge: Lack of readiness of telemedicine infrastructure Solutions: Establish a standard procedure to use the system; increase the number of personnel
Alshamrani et al. <sup>35</sup>	Convert IV to oral or subcutaneous chemotherapy	Challenges: Low patient adherence; increased risk of side effects Solutions: Provide proper medication supply, comprehensive patient education, intensive and proper dose adjustment, and close drug monitoring
<b>Effectiveness and acceptability</b>		
McNamara et al. <sup>31</sup>	Provide clinical pharmacy services by using telehealth system	Challenges: Patients' lack of adherence to drug monitoring; communication barriers; technological issues Solutions: Provide video and telephone visits; provide training for providers and patients; establish guidance for using the telehealth system
<b>Effectiveness and efficiency</b>		
Asseri et al. <sup>37</sup>	Develop a combination of on-site and remote staff through secure access to the intrahospital information system	Challenges: Adaptation to new design of telepharmacy model; improper technology infrastructure (e.g., disconnected signal networks) Solutions: Provide training for health care providers on using the system; provide collaborative multidisciplinary work
<b>Safety</b>		
Ibrahim et al. <sup>33</sup>	Provide on-site telepharmacy system	Challenge: Technological issues Solutions: Develop an established telepharmacy system with capable pharmacists; provide training for pharmacists
Al Meslamani et al. <sup>36</sup>	Provide pharmaceutical care using phone calls and social media applications	Challenges: Patients' lack of adherence to treatment and lifestyle management; technological issues, including signal connection, network, and data privacy; lack of readiness of personnel to deliver pharmaceutical care Solutions: Build a broadband signal connection with secure access; provide intensive training for pharmacists and patients

## Efficiency

During the pandemic, it was recommended that pharmacists switch the route of administration of chemotherapy from IV to oral for individuals with stable cancer.<sup>35</sup> Patients were notified by means of a phone call when their medication was ready for pickup in a drive-through system. Telepharmacy helped pharmacists to process any new medication requests by activating an electronic refill function through the hospital's online portal.<sup>37</sup> With this system, new orders from physicians were received through the computerized order system. The submitted order could then be reviewed and verified remotely. Implementation of telepharmacy in the hospital setting was associated with higher efficiency and maintained the quality of pharmacy services.<sup>37</sup>

## Safety

Telepharmacy was used to identify prescription-related and medication dispensing errors through websites, cloud-based systems, social media, and videoconferencing systems. The implementation of these technologies resulted in a low incidence of medication dispensing errors.<sup>33</sup> In the United Arab Emirates, telepharmacy decreased the potential misuse of over-the-counter medicines and helped pharmacists in identifying the most common drugs with potential abuse.<sup>34</sup> Wang and others<sup>43</sup> reported that a telepharmacy system, including telephone and mobile applications, was used to identify and solve drug-related problems, side effects, and adverse reactions. Al Meslamani and others<sup>36</sup> stated that telepharmacy implementation led to improvements in clinical outcomes, including the substitution of prescribed medication, dose optimization, and recommendations to continue or discontinue therapies in patients with COVID-19. Regarding the protection of personnel, Asseri and others<sup>37</sup> designed a new workflow for staff working both on site and remotely using secure virtual private network access to the hospital information system. This model aimed to reduce the need for personal protective equipment by decreasing crowding and the risk of viral transmission in the working area.<sup>37</sup>

## Assessment of Bias

Of the 19 studies included in the analysis, most explained their methodology in insufficient detail, omitting information about type of sampling, sample size calculation, statistical tools, and statistical analysis.<sup>28,30,33,37-39,41-44,46</sup> Some of the studies presented the results of telepharmacy use with descriptive statistics, such as the percentage of patients satisfied with their care and the number of dispensed medications.<sup>38,39,42</sup> Only 1 study conducted a comparative analysis of 2 groups, examining resolution of medication-related problems through telehealth versus face-to-face pharmacy visits.<sup>31</sup> Details of the bias assessment are available by request to the corresponding author.

## DISCUSSION

The COVID-19 pandemic has caused a rapid increase in the demand for telepharmacy. The purpose of this review was to explore the various ways in which this technology was used in pharmacy practice during the pandemic and to provide insights into designing telepharmacy guidelines and a model of telepharmacy for the future. Given the rapid spread of viral infection and the short span of the pandemic, pharmacists adapted quickly to using telepharmacy to overcome restrictions on face-to-face interaction.<sup>47</sup> The review highlighted the implementation of telepharmacy in various countries, the devices and technologies used for telepharmacy, the benefits of implementation, and the solutions to overcome shortcomings of patient care with this approach. Pharmacists have been working diligently to keep up with the fast pace of telepharmacy implementation, developing components such as mobile applications, websites, social media, and videoconferencing platforms to provide pharmaceutical care. Different countries have developed different telepharmacy systems to suit their respective cultures and patient needs while maintaining the overall concept of providing health care communication among professionals. However, these platforms need legislative support, covering aspects such as patient safety, data security, and credentialing for pharmacists. It is also important to consider how telemedicine policies will change after the pandemic.

## Keys to Telepharmacy Implementation

The three aspects that should be highlighted when implementing telepharmacy are prevention and preparedness, response, and recovery.<sup>25</sup> Prevention and preparedness emphasize the importance of mitigation and infection control, including protection of personnel, adherence to safety protocols, and management of demand and supply of medications and health devices. Response and recovery emphasize pharmacists' rapid actions to respond to patients' needs while building a stable, efficient telepharmacy system.

## Prevention and Preparedness

Hospitals are viewed as the front line in the fight against COVID-19, and the health care system and its personnel must understand the process of disease mitigation. In addition to their vital roles in medication supply, distribution, and management, pharmacists should plan how to provide pharmacy services using telepharmacy. A model from a shelter hospital in China could be used as a reference in building an adaptive system.<sup>42,48</sup> Telepharmacy might consist of an electronic information platform supported by the cloud and connected with electronic health records to allow data recording and transfer. The design of online media to monitor a patient's condition using the chat application on a smartphone was also welcomed.<sup>42,49</sup> Such applications can effectively decrease the possibility of hospital-acquired infections and improve the efficiency of handling the pharmacy



workload. Another essential role for pharmacists was providing preventive health education related to controlling spread of the virus, including hand hygiene, early detection of COVID-19 infection, referral procedures, and stress management.<sup>42,48</sup> These activities could be promoted by live broadcasts on radio stations or social media, pre-recorded and animated videos, and group chat applications.<sup>42</sup>

### Response

*Medication Reviews, Dispensing, and Delivery:* To reduce the chance of viral transmission among personnel and patients, pharmacists need to be responsive while employing safe, innovative methods for dispensing and delivering medications. As a result, remote review of inpatient orders with automated dispensing cabinets was recommended.<sup>42</sup> Furthermore, to ensure patient safety related to sterile components, the at-home administration of chemotherapy using a specific device was initiated.<sup>35</sup> IV medications were dispensed through pharmacy IV admixture services.<sup>42</sup> In Canada, health care providers preferred telepharmacy over treatment delay.<sup>50</sup> The included studies also explicitly recommended the use of safety transfer devices<sup>36,37</sup> and promoted a model of own-device utilization<sup>30</sup> to reduce the transmission of infection. Finally, the preparation of sterile compounds often involves pharmacy technicians, which makes in-charge supervision by pharmacists essential to ensure that safety concerns are addressed.

*Pharmacist–Patient Communication:* Pharmacists primarily used telepharmacy for communicating with their patients.<sup>47</sup> Consultations could be conducted by phone or another suitable communication platform. Furthermore, virtual communication was deemed appropriate for low-risk patients with access to technology.<sup>51</sup> Several points were highlighted for building a virtual communication system, including preparation for the visit, consent and privacy, and documentation. It is important to note that not every consultation requires a video component, depending on the patient's comfort level in receiving information by phone or by videoconferencing system. However, visual contact is recommended, especially when delivering information about dosage administration or for gauging patients' understanding of and adherence to their medication therapy. Obtaining consent is a top priority, and pharmacists should advise patients to use their devices with secure internet access. Delays in response due to technical problems could lead to a lack of trust and less frequent pharmacist–patient communication, which is essential in building a professional relationship.<sup>52</sup>

### Recovery

Despite the difficulty of predicting the post-pandemic situation, changes in public behaviour and the growth of telehealth infrastructure have encouraged pharmacists to incorporate telepharmacy into their practice. However,

certain aspects must be considered to ensure that telepharmacy is effective for delivering pharmaceutical care, including time to prepare for virtual appointments, activities, productivity and workflow, security guidelines, and training, as well as the interactions between telepharmacy and on-site pharmacists.

First, pharmacists should design appropriate platforms for efficient work. In particular, it is important to establish suitable and appropriate procedures for communication between the on-site and off-site teams. Lack of in-person interaction could be mitigated by scheduling of rounds, whereby pharmacists' work is divided into blocks of online and in-person shifts.<sup>53</sup> The schedule can then be adjusted to accommodate the allocation of team members and patient rounds.

Second, pharmacists should set up their target users, such as patients with chronic conditions (including diabetes, hypertension, and cancer) who may regularly use this service. Each chronic condition has its own specific treatments and goals.<sup>53</sup> Older people are more prone to drug-related problems and the risk of COVID-19 infection, and our review found that older adults were more engaged with telepharmacy systems. Once a telepharmacy system has been developed, it should be adjusted over time to meet the changing needs of its users. Before a specific telepharmacy practice model is established, the organization's priorities should be considered to help in determining which activities will be suited to telepharmacy. Specific types of pharmaceutical care that could be delivered by telepharmacy were antimicrobial stewardship, opioid stewardship, and sedation management in the intensive care unit.<sup>53</sup>

Third, multidisciplinary collaboration and interprofessional activities were significant, as highlighted in 2 of the included studies.<sup>28,29</sup> Interprofessional rounds utilized a teleconference system and chat application within the team.<sup>53</sup> It has been shown that pharmacists were able to work more effectively in a fully integrated interprofessional team rather than in an interprofessional team.<sup>53,54</sup> Integrating telepharmacy into the existing workflow could help in expanding clinical care. Although some might argue that telepharmacy is a step backward from on-site clinical pharmacy service (given the “new normal” and the loosening of COVID-19 restrictions), evidence has shown that a combination of on-site pharmacy activities and telepharmacy could lead to expansion of clinical pharmacy services.<sup>51</sup> To improve telepharmacy services, on-duty health care providers should be encouraged to record as much information as possible about patients' progress, which could further benefit patient care provided by the interprofessional team.

Fourth, pharmacy associations need to intensively advocate for stakeholders to establish policies and regulations that will support the continued use of telepharmacy. Ideally, these policies and regulations should be established before implementation of telepharmacy in hospital and

community settings, such as a policy for national electronic prescription transfer system to allow prescriptions to be sent and received by email.<sup>55</sup> At the level of health care administration, transitioning to an electronic claims reimbursement system should be considered.<sup>56,57</sup> Finally, a robust framework for implementing telepharmacy at the regional and national levels may be urgently needed.

### Challenges of Implementing Telepharmacy

To increase access to telepharmacy and its rate of use, developers should address potential challenges identified through end-users' feedback, which reflects actual experiences. The challenges that could arise during implementation of telepharmacy, highlighted in Table 3, include technological issues, such as connection, data access, and privacy; communication barriers between patients and health care providers; readiness of personnel and their capability to perform proper pharmaceutical care remotely; and patients' adherence to treatment and monitoring.<sup>14</sup> According to Park and others,<sup>14</sup> the key elements of successful telepharmacy implementation are a user-friendly system, secure privacy and data protection, easy access, appropriate technology infrastructure, and simple instructions for users. Another study investigated the barriers to implementing this technology among pharmacists working in Iran<sup>20</sup> and found that the major challenges included lack of reimbursement,<sup>57</sup> poor access to technology, insecure access to patients' data,<sup>57,58</sup> pharmacists' lack of skills, and limited coordination among health care providers, government, and system management.

### Access to Technology and Data Privacy

Telepharmacy is directly associated with access to technology. The protection of patients' data and privacy was a major concern when it came to assessing and transferring electronic data.<sup>51,58</sup> Telepharmacy as a component of telemedicine was supported by platforms compliant with the US Health Insurance Portability and Accountability Act.<sup>59</sup> A nonsecure platform was acceptable in the early phase of the pandemic; however, for the future, pharmacists should consider use of a secure platform designed specifically for professional communication, one that complies with the laws and regulations of the particular jurisdiction. Video communication platforms should be equipped with appropriate security to prevent data leaks. Furthermore, texting and text- or video-based social media applications should use end-to-end encryption of information.<sup>58</sup> Public-facing communication platforms, such as Facebook Live and TikTok, are not recommended. High image and video quality are necessary when transmitting medical information. Additionally, reliable internet access remains crucial, as it plays a vital role in data transfer. Poor access to the internet can increase frustration levels among those using telepharmacy services.<sup>52</sup> Such access may not be fully stable

in certain geographic areas; for example, some patients avoided participating in telemedicine visits because of a lack of suitable infrastructure.<sup>60</sup>

### Pharmacists' Skills

To improve the frequency of communication, it was deemed important to invest in human resources, for example, by training hospital pharmacists, pharmacy interns, and pharmacy students on how to implement telepharmacy.<sup>54,61</sup> Suitable training would enhance rapid adaptation to the system. A mixed-methods study to investigate pharmacy students' digital health literacy showed that they felt challenged to learn new digital tools.<sup>14</sup> It was observed that the pharmacy manager gave the students opportunities to gain practical experience in using technologies during their training.<sup>14</sup> Providing education on how to use telepharmacy is crucial for pharmacists to remain up to date with current practices.

### Strategies to Overcome Challenges

#### A Proposed Telepharmacy Model

The delivery of pharmaceutical care during the pandemic poses several challenges, specifically in ensuring the quality and continuity of care. We propose here a telepharmacy model for delivering pharmaceutical care after the COVID-19 pandemic, as shown in Figure 4. According to this model, patients input up-to-date information related to their clinical condition using a smartphone, and pharmacists have log-in access to the system. A cloud-based database system is used to collect data input by both patients and physicians. Pharmacists review the patient's medication history and prescriptions, optimize and adjust the dose as appropriate, input the medication order, and authorize the prescription for dispensing. To facilitate efficient workflow and decrease excessive foot traffic, safety storage cabinets are provided for medication return and pick-up. Each medication is checked by another pharmacist before it is delivered to the patient.<sup>50</sup> The various aspects that should be carefully planned before implementing this model are digital and health literacy of both patients and pharmacists, accessibility, cultural adaptation, in-charge staffing, and pay-per-performance.

### Government Response

In response to the pandemic, governments should take action to support the rapid growth of telepharmacy. In the US, reimbursement for telepharmacy services has been expanding, affecting certain health care programs such as Medicare, Medicaid, and an insurance program for children.<sup>52,57</sup> The services covered included audio-only phone calls and visits to the emergency department.<sup>62</sup> This system may be used by health care providers for both new and established patients. Furthermore, private payer insurance systems for telehealth services in the US depend on state-level regulations. Health care systems in each country should be vigilant in supporting the affordable implementation of telepharmacy to

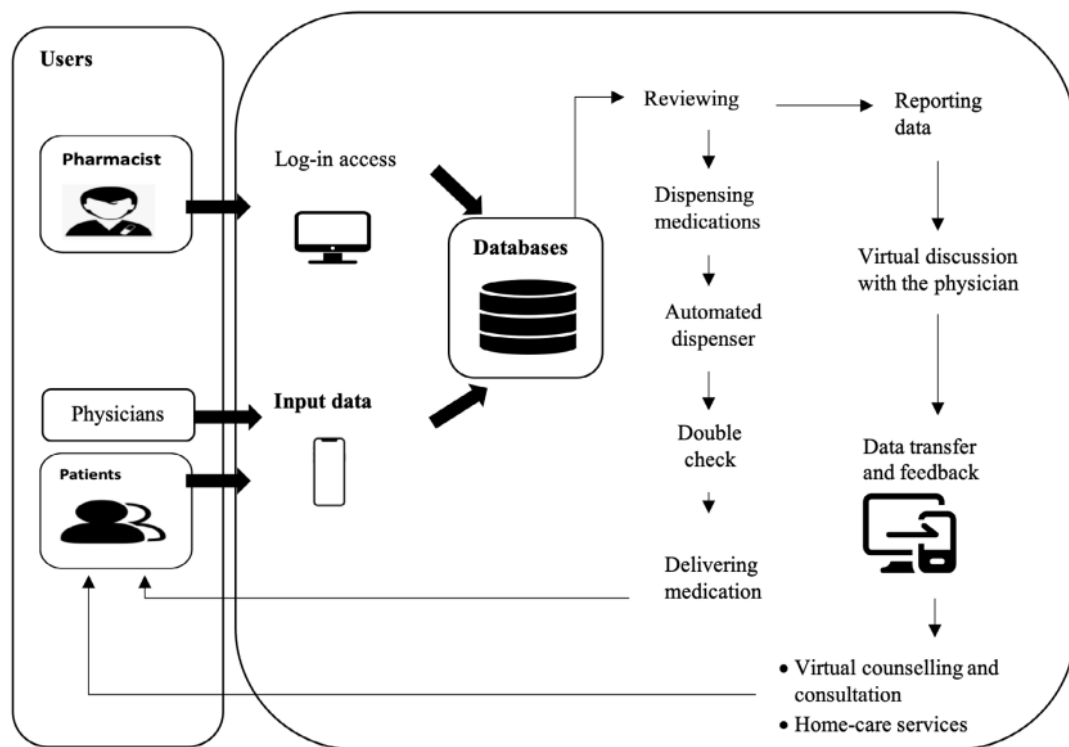


FIGURE 4. Description of telepharmacy service system during and after COVID-19 pandemic.

avoid inadvertently limiting access to pharmaceutical services along cultural and economic lines. This requires greater investments, more infrastructure, and the development of policies and regulations at the levels of health care associations, institutions, and nations as a whole to maintain the quality and equity of care.

### Strengths and Limitations

Despite the differences in health care systems among countries, telepharmacy emphasized the direct involvement of pharmacists in delivering patient-centred care.<sup>17,63</sup> This study has highlighted the activities of pharmacists, who have faced many challenges during the pandemic, such as lockdowns, lack of medical supplies, and non-availability of COVID-19 vaccines. The studies included in our review suggest various actions that should be considered to prepare for the next outbreak, including prevention and preparedness, response, and recovery.<sup>54</sup>

Despite these promising strategies, there is a lack of evidence about the long-term efficacy of telepharmacy services. Telephone follow-up might improve access to care for patients with chronic conditions, but face-to-face visits remain irreplaceable.<sup>31</sup> Furthermore, clinical trials evaluating telepharmacy implementation during the pandemic were lacking, specifically when patients were required to obey

physical distancing restrictions and limit their in-person visits to health care facilities. Observational studies reporting the initial benefits of short-term telepharmacy use in various countries might yield insights about the continued use of telepharmacy in the future. Non-English articles capturing the experience of telepharmacy use in other forms of care, such as emergency care or pediatrics, were excluded from our review. However, the included studies pointed to rapid responses to telepharmacy use in various services, such as HIV/AIDS care,<sup>40</sup> palliative care,<sup>35</sup> and anticoagulation care.<sup>46</sup> This study did not explore the cost-effectiveness of telepharmacy services, which is one of the barriers to accessing this type of service.<sup>64,65</sup> Finally, the implementation of this innovative approach remains a challenge for future pharmacy services.

### Further Study

Future researchers may be interested in developing and evaluating a telepharmacy system. It is important to carefully plan future studies to explore users' feedback and to determine the appropriate reimbursement model for telepharmacy, both for acute care and chronic disease management. In addition, the long-term impacts of telepharmacy on clinical, humanistic, and economic outcomes require further study.



## CONCLUSION

Telepharmacy supported the activities of pharmacists during the COVID-19 pandemic. However, the clinical and economic outcomes of implementing telepharmacy are still under debate. Hospital pharmacists, pharmacy associations, stakeholders, government, and researchers should carefully consider several aspects of telepharmacy, such as readiness of the technological infrastructure, the types of pharmaceutical services to be offered, and multidisciplinary collaboration.

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