Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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SARS-CoV-2 outbreak: How can pharmacists help?

Osama M. Al-Quteimat MSc, BCOP[a,**], Amer Mustafa Amer R.Ph, MSc[b]

[a] Pharmacy Services Department, Cleveland Clinic Abu Dhabi, Abu Dhabi, United Arab Emirates
[b] The Speciality Hospital, Amman, Jordan

A B S T R A C T

Coronaviruses (CoVs) are a large family of viruses that cause disorders ranging from a mild cold to severe disease. Some of the CoVs are zoonotic, meaning they can be transmitted from animals to humans. In December 2019, the world awoke to a new zoonotic strain of CoV that was named SARS-CoV-2 (standing for severe acute respiratory syndrome coronavirus 2), which has been classified as a high-consequence infectious disease. In addition, serious complications related to COVID-19 have been reported in some patients. These include acute respiratory distress syndrome, acute renal failure, septic shock and ventilator-associated pneumonia.

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Introduction

Coronaviruses (CoVs) are a large family of viruses that cause disorders ranging from a mild cold to severe disease. Some of the CoVs are zoonotic, meaning they can be transmitted from animals to humans. In December 2019, the world awoke to a new zoonotic strain of CoV that was named SARS-CoV-2 (standing for severe acute respiratory syndrome coronavirus 2), which has been classified as a high-consequence infectious disease. The virus has an incubation period of 2–14 days before symptoms appear. These symptoms can range from mild to severe, and include fever, dry cough, shortness of breath and muscle ache. In addition, serious complications related to COVID-19 have been reported in some patients. These include acute respiratory distress syndrome, acute renal failure, septic shock and ventilator-associated pneumonia.[1,2]

Elderly patients and patients with comorbid diseases (such as diabetes, hypertension, cardiovascular disease and cancer) are considered to be at higher risk of developing serious complications. COVID-19 is, thus, causing fear worldwide. The pharmacist, as a healthcare practitioner, can play an important role in hindering the spread of COVID-19, and can be an active participant in national and community efforts to fight and contain this outbreak.[1,2]

The pharmacist's role as a healthcare professional

Pharmacists are the most accessible healthcare providers, and so understanding the epidemiology of COVID-19, its transmission and how to prevent it spreading, and being aware of informative federal resources regarding COVID-19 strategies are important considerations. All pharmacy professionals should keep up to date, and be familiar, with the latest CoV prevention and treatment guidelines, which are rapidly changing.[1]

Several resources are available to help pharmacists worldwide care for individuals and communities, such as the American Pharmacists' Association (APhA) resource centre webpage, which provides the latest information from federal agencies and a decision-tree document that can be used to assist pharmacists in talking to individuals with different levels of COVID-19 risk. The APhA has also recently issued a tool — *Preparedness and Prevention Guidance during Coronavirus Pandemic* — to help pharmacists be prepared.[3] For preparing clinicians to respond to health threats and emergencies related to disease outbreaks and disasters, the Centres for Disease Control and Prevention's (CDC's) Clinician Outreach and Communication Activity (COCA) is a vital information source.[3]

In addition, many reference documents are now being made available to pharmacists so they can have access to the latest updates regarding COVID-19 management. The American Society of Hospital Pharmacists (ASHP) has recently initiated a comprehensive online resource that includes most of the COVID-19-related pharmacy information and free, 60-day open access to ASHP drug information.[4] It should be noted that pharmacists should regularly review these pharmaceutical recommendations because changes are expected as information about the virus accumulates. Below are directions to some of these online resources:

* https://www.cdc.gov/coronavirus/2019-ncov/index.html.
* https://jamanetwork.com/journals/jama/pages/coronavirus-alert.
* https://www.idsociety.org/public-health/Novel-Coronavirus/.
* https://www.ashp.org/Pharmacy-Practice/Resource-Centers/Coronavirus.

Since pharmacists often have front-line contact with infected

* Corresponding author.
E-mail address: Alquteo@clevelandclinicabudhabi.ae (O.M. Al-Quteimat).

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patients, they need to pay attention to protecting themselves. The World Health Organization (WHO) has recommended that healthcare staff wear appropriate eye protection, surgical masks, long-sleeved gowns and gloves when entering a room containing suspected or confirmed COVID-19-infected individuals. WHO has also recommended using a particulate respirator that is at least as protective as a US National Institute for Occupational Safety and Health-certified N95 when performing aerosol-generating procedures such as tracheal intubation, non-invasive ventilation, tracheostomy, cardiopulmonary resuscitation or manual ventilation before intubation or bronchoscopy).[5] However, self-isolation of pharmacists who have been in contact with suspected COVID-19 individuals are not obliged to wear these unless otherwise ordered by health protection professionals.[6]

The pharmacist's role in the community pharmacy

The pharmacist is the most accessible healthcare provider and can act as an adviser in a public health capacity, increasing community awareness by providing appropriate information, advising on precautionary measures and offering counselling. Moreover, they are a primary supplier of necessary products, and can encourage the individuals with suspected COVID-19 (and their families) to wear medical masks, whilst giving advice on when to get treatment from healthcare facilities. Additionally, the pharmacist should be alert to their customers' travel to high-risk areas and their personal contact histories.[1,2,6]

Pharmacists should advise people not suspected of having COVID-19 to practice social distancing and avoid enclosed, crowded spaces, and inform them to maintain a protective distance of at least 2 m from any individuals suspected of having COVID-19. They should encourage practicing regular and effective hand hygiene, and demonstrate the polite and less infectious ways of coughing or sneezing by covering the nose and mouth with a flexed elbow or paper tissue, as well as discarding the tissue immediately after use into an appropriate receptacle, cleaning the hands with, soap and water and avoiding touching the facial T-zone (mouth, nose, eyes) both before and after washing their hands.[1]

Community pharmacists can play a significant role in recommending symptom management for mild conditions, making sure medications are refilled on schedule, obtaining insurance overrides for concerned patients and prescribing over-the-counter medications for certain indications, which can reduce unnecessary hospital visits, where individuals might be exposed to COVID-19.

Pharmacies and pharmaceutical associations can also prepare information materials for the community, such as posters, leaflets, websites, text messages and app alerts, in order to clarify government guidelines and any other information that may be related to the disease. They can also arrange ask-and-answer sessions in, for example, schools and community centres.[1]

To control against a COVID-19 outbreak at a community pharmacy, the UK's National Health Service has recommended that pharmacies prepare an isolation space for patients suspected of having COVID-19. If the pharmacy does not have a suitable isolation room, an area in which individuals can be kept at least 2 m away from the staff and customers is recommended. The standard operating procedure (SOP) advises pharmacies to declutter and remove non-essential furnishings and items. This will assist the decontamination process. In addition, a telephone should be kept in the isolation room/space, and a pharmacy card should be provided for further consultation about the disease.[7]

Offering a home-delivery service for medications, with the pharmacist performing online or phone counselling, whenever feasible, is another tool that can help patients who have limited access to community pharmacies, especially high-risk individuals or those undertaking home quarantine or isolation.

Following an incident, SOP involves the contaminated area where the individual was located not being used, with the door to the room being kept closed, the windows opened and any air-conditioning being switched off, until the site has been disinfected. Also, any waste from the contaminated area should be kept until the individual's test results are known. If an individual suspected of having COVID-19 spent time in any public areas, such as a waiting area or bathroom, then these areas must be cleaned.[3]

However, some pharmacists have advised against some of these recommendations because preparing an isolation area in a community pharmacy might encourage individuals to present at the pharmacy, believing that it is a safe place, and this could put pharmacy staff at greater risk of infection. Furthermore, the SOP recommendation to establish isolation areas in community pharmacies would be time-consuming and costly, potentially making it not practicable for many pharmacies.[7] Finally, community pharmacies should stay open unless advised to close by the health protection team.[2]

The role of clinical and infectious disease pharmacists

The clinical pharmacist can play a significant role in identifying, preventing and treating medication-related problems. In order to minimise any potential exposure, direct contact with COVID-19-infected individuals must be restricted to the caregivers that provide essential health services in a hospital context, including nurses, respiratory therapists and physicians. Patient counselling, medication reconciliation and other in-hospital pharmacy services can be performed remotely, if needed (using indirect communication tools, such as an individual's room phone, if available), or via the primary nurse taking care of such individuals.

Clinical pharmacists must keep their knowledge up to date on the latest information from federal agencies, such as the CDC, and be aware of the CDC's reporting on symptom presentation, conducting initial screenings, confirming that individuals have the appropriate epidemiological risk factors that might indicate COVID-19, and providing appropriate management.[6]

Currently, there is no specific treatment or approved vaccine against COVID-19. Efforts are currently being directed at identifying, isolating and containing the disease, with treatment being symptomatic, according to the clinical condition of the individual. Supportive treatment, such as oxygen therapy, hydration, fever/pain management, and antibiotics, if bacterial co-infection is present, have been recommended.[1,2]

Several trials are currently investigating potential medications as treatment options for COVID-19, including remdesivir, immunoglobulins, arbidol hydrochloride combined with interferon atomisation, ASC09F plus oseltamivir, ritonavir plus oseltamivir, lopinavir plus ritonavir, mesenchymal stem cell treatment, darunavir plus cobicistat, hydroxy-chloroquine, methylprednisolone and washed microbiota transplantation.[8] Intravenous remdesivir (a novel nucleotide-analogue prodrug that was developed for Ebola virus disease in phase 2 clinical trial) has been used in some patients with potential efficacy against COVID-19. Also, chloroquine phosphate has shown some efficacy in treating COVID-19-associated pneumonia.[1,9] It's important to consider that clinical safety and efficacy of remdesivir and chloroquine have not been established yet by well-designed phase 3 clinical trials and any potential use risk vs benefit balance should considered before using such agents to avoid any toxicity, complications or side effects from such treatment.

Recently, an open-label, randomised trial, published in the *New England Journal of Medicine*, reported that no benefit was observed using an antiviral combination of lopinavir plus ritonavir, the treatment adding no value beyond standard care in severely ill, hospitalised COVID-19-infected individuals.[10]

It is important to mention here that, due to the spread of different experts' opinions on the safety of some of the medications being used on COVID-19-infected individuals, pharmacists should be prepared to address individuals' concerns about using steroids, ibuprofen, angiotensin receptor blockers and angiotensin-converting enzyme (ACE) inhibitors,

and provide appropriate counselling regarding these medications, based on the latest US Food and Drug Administration (FDA) recommendations.

ACE inhibitors and angiotensin receptor blockers (ARBs), mostly used to treat hypertension, are associated with increased expression of ACE2. SARS-CoV-2 binds to the host cells through ACE2. Overexpression of ACE2 has been reported in patients with type 1 or type 2 diabeted treated with ACE inhibitors and ARBs.[11] However, currently there is no strong evidence to support the assertion that treatment with ACE inhibitors or ARBs could predispose individuals to a higher risk of COVID-19 or adverse outcomes should they become infected with coronavirus/COVID-19. At this time, the International Pharmaceutical Federation (FIP) has recommended continuing to treat with ACE inhibitors or angiotensin receptor blockers, unless specifically advised otherwise by the individual's medical team. It is very important to keep on top of updates from the FDA or WHO, as their recommendations are susceptible to modification as new evidence becomes available.[12]

Data in support of the efficacy and safety of these drugs is, in most cases, circumstantial and weak. Using drugs with unproven benefits may represent experimental use. Intentional research using such agents should be approved by the institutional review board, and informed consent needs to be applied. Clinical pharmacists can play a significant role in getting individuals enrolled in such ongoing studies.

Antimicrobial stewardship programmes, involving physicians, pharmacists, infection preventionists and other practitioners with advanced training in infectious diseases (IDs), are vital in assuring the safety and quality of healthcare services, particularly during outbreaks of serious infection. As essential members of antimicrobial stewardship programmes, ID pharmacists have the opportunity to support emerging pathogen-response and planning efforts. The ID pharmacist can coordinate with the microbiology laboratory for the interpretation of, and action involving, COVID-19 test results, monitor compliance with institutional guidelines, prepare and implement local treatment protocols, monitor and manage drug shortages and help in investigations of new drug applications and uses.[13]

Clinical and ID pharmacists need to familiarise themselves with all drug-related information that may be required in COVID-19 cases, including dosing and dose adjustment, drug/drug interactions, drug/food interactions, adverse effects, monitoring parameters and the pharmacokinetics of all drugs that may be used. They must also be well-prepared to provide the best available recommendations to all healthcare practitioners. Additionally, in light of the lack of a currently approved treatment for COVID-19, pharmacists working in the pharmaceutical supply chain should be prepared to manage any potential medication or pharmacy consumable shortages (such as protective personal equipments, intravenous bags and syringes), to work proactively on having a plan to judiciously use the current resources, and be prepared to face increased case loads or emergency scenarios.

Finally, stigma can negatively affect both the emotional and mental health of infected individuals. The CDC has acknowledged that stopping stigma is vital to make community members resilient and that everyone can help to stop the spread of stigma related to COVID-19. Pharmacists can play a role in this by promoting an empathy culture and helping to prevent the stigmatisation of infected individuals based on ethnicity, population or nationality by broadcasting facts in their communities via various media. In this way, they can protect COVID-19-infected individuals from social avoidance or rejection, and/or being denied healthcare, education, housing or employment, and/or even physical violence.[14]

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