Clinical Pharmacy Services during COVID-19 Pandemic-An Overview

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Abstract

Clinical roles of pharmacists in optimizing medication therapy without compromising the efficacy and relevance have been proved in assuring patient safety. Recently addressed promising influences of clinical pharmacists in healthcare emergencies during COVID-19 need to highlight and summarize to aid system-level and patient-specific treatment decisions, and thereby to enhance the scope of service globally. Here we authors intend to deliver an overview of clinical pharmacy interventions/guidance provided by pharmacists/societies during the COVID-19 Pandemic. Many studies illustrated the clinical roles of pharmacists in response to COVID-19 related challenges, and the necessity of value-added patient-centered active services, in collaboration and communication with other interdisciplinary departments. The review observed that, in managing public health emergencies during COVID19, using their professional expertise, clinical pharmacists did many innovative roles in all major areas like cardiology, endocrinology, gastro-enterology, adverse drug reaction, drug interaction, psychiatry, oncology, anticoagulation clinic etc. Bringing all such interventions and opportunities, together with attention to pharmacy professionals, surely boosts both the profession and public health globally. We suggest, responsible authorities periodically need to assess, consolidate and guide on all possible influences of the clinical pharmacist's that can do in current pandemic situations and which will help to enhance the scope of the clinical pharmacist's service in different patient/drug/disease groups in the COVID-19 era.

Keywords: Pharmaceutical Care; Clinical Pharmacy; Medication Management; COVID

Introduction

The coronavirus disease 2019 (COVID-19) emerged in China and gradually led to the Pandemic and has caused unprecedented stresses on the global health care system. The health care system adopted health care challenges and transformed rapidly [1]. To keep the social distancing and to reduce the spread of COVID-19 infection, pharmacists are performing non-face-to-face pharmacy practices from remote locations and also from their homes [2]. As of August 25, 2020, almost 24 million people were infected, with 819,131 deaths reported globally [3]. The World Health Organization declared COVID-19 a global pandemic on March 11 [4]. The Center for Disease Control and Prevention states that the predominant symptoms are fever, shortness of breath, cough or difficulty in breathing, chills, muscle pain, sore throat and loss of taste or smell [5].

As an essential member of health care team along with physicians, nurses, respiratory therapist and other team members clinical pharmacists are contributing to COVID-19 management protocols by their active involvement in various clinical activities such as ward rounds

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and ensuring sufficient medication supply to support ICU patients, also by implementing conversation strategies to manage critical drug shortages. Clinical pharmacists are involved in rapid response to pathogen outbreak. As part of antimicrobial stewardship programs, clinical pharmacists are involved in creating treatment protocols to monitor the antiviral and antibiotic uses in COVID-19 patients [6,7]. During the COVID-19 Pandemic, clinical pharmacists, are involving in developing evidence-based decisions for drug use and monitoring and also ensuring medication safety and efficacy. As a collaborative work along with other medical teams, pharmacists can improve clinical outcomes and mortality rates in COVID-19 patients [8,9]. Another essential role that hospital pharmacists play in ensuring the availability and timely provision of medications for their patients. This role is particularly imperative in light of an increase in consumption as a result of the potential surge in the number of hospitalized patients and a decrease in supply as a result of a disruption in the manufacturing process [10]. Pharmacists must be proactive in identifying drugs that are in short supply and plan accordingly to mitigate drug shortages and reduce the negative impact on patients [11]. Many institutions are also experiencing shortages in personal protective equipment and hand sanitizers. Pharmacists can minimize the use of masks and gowns by restricting entry into patients' rooms. Counseling patients can accomplish this through telehealth and by aligning medication administration times with other necessary patient interactions [12].

The high demand for pharmacists handling call center pharmacy services is also evident in the COVID-19 Pandemic in medication pick up and renewal requests and patient counseling [13]. In public health affairs, pharmacists have played a yeoman's role. In the United States, the collaboration between pharmacists and physicians helped in receiving timely treatment in the flu season [14]. Likewise, Canadian pharmacists played an essential role in two outbreaks of the severe acute respiratory syndrome (SARS) [15].

Although many medications' name was trending for COVID-19 treatment and much exciting news coming about the vaccine, at present, no drugs or vaccine has been proved effective against coronavirus [16]. During COVID-19, clinical pharmacists also play another important role in formulating individualized drug regimens to improve the cure rate by combining pharmacokinetics parameters, liver and kidney function tests [17]. Treating and managing COVID-19 hospitalized patients is a massive global challenge. In many patients immediately declining health condition leads to critical cases, with acute respiratory distress syndrome, sepsis, and multiple organ damage, particularly in immunocompromised and patients with chronic diseases [18,19]. This Pandemic had reassured the inevitability of clinical pharmacists in the healthcare system in optimizing patient care.

Along with the uncertainty of its end, the novel SARS COV 2 virus infection shows new symptoms and mannerisms daily, which makes this disease more complex. The role of clinical pharmacists as drug information experts helps evaluate literature related to a novel or repurposed COVID 19 therapies. This will help make system-level and patient-specific treatment decisions and ensure access to these therapies and other drugs in an emergency due to pandemic [20].

Three authors individually performed a literature search on clinical interventions and guidance by clinical pharmacists during the Pandemic, published in EMBASE, PubMed and Google Scholar between March 20, 2020, and August 20, 2020. Many articles were found relevant to the subject, including those mentioned in the introduction part. To be specific, the following population/drug/disease-based studies on clinical guidance/interventions by the clinical pharmacists during COVID 19 were found, which will help guide more evidence-based practices.

Diabetic patient care during the COVID-19 pandemic

Diabetes mellitus predisposes to a particularly severe course of the disease and doubles the COVID-19 mortality risk due to pulmonary and cardiac involvement. Besides, diabetes patients often suffer from comorbidities, which further worsen clinical outcomes. Peric S., *et al.* recommend the pharmacist to focus on pharmacotherapeutic changes of insulin, metformin, gliclazide, sodium-glucose cotransporter two inhibitors (SGLT2i), GLP-1 receptor agonist, statin therapy, dipeptidyl peptidase-4 inhibitors (DPP4i), pioglitazone to be made in the delivery of care including promoting positive lifestyle changes and recommending right pharmacotherapeutic agents to ensure appropriate attention to the diabetic patients during and post COVID-19 era. The authors recommend various monitoring and educational aspects

of diabetic medications and special precautions on social distancing, challenges of glycemic control, the necessity of glycemic control, and integrated, evidence-based clinical practice [21,22].

Pharmacist-driven education programs for solid organ transplant recipients and inflammatory bowel disease patients

Within a professional capacity, pharmacists continue to provide information and advice on medications to patients and their caregivers to avoid medical complexity and to improve adherence. Ashley Fan., *et al.* take a patient education initiatives step for solid organ transplant patients using various effective tools during the Pandemic. The initiatives prove the positive outcomes even for orthotopic heart transplantation patients. The first initiative was to create a sample medication list for medication knowledge-sharing sessions, which provides a brief idea of what they will take home and educates them on drug usage and learning medication name and dosage directions. The second initiative was to create color-coded flashcards for therapeutic agents. Patients read the cards both on their own and in a session conducted by orthotopic heart transplantation pharmacists. To get the maximum outcomes of the education session, there was a questionnaire created for patients to measure understanding of medication use. Other measures implemented were to adopt a telemedicine approach, such as providing gadgets to conduct virtual education sessions. This novel educational standards have been efficiently implemented and proved a hike in patients' satisfaction. Above discussed pharmacist innovative patient education steps during this Pandemic minimize the risk of exposure of COVID-19 to all chronic patients [23].

Another education-based intervention by the clinical pharmacist was demonstrated by Bhat S., *et al.* in IBD patients. For patients initiated on self-injectable biologics, clinical pharmacists can utilize a video platform to review medication administration techniques, storage, and disposal and provide personalized administration feedback for patients in the comfort of their homes. For patients already on treatment, clinical pharmacists are providing clinical follow-up to ensure treatment efficacy and safety. While most laboratory monitoring is currently being deferred, for patients requiring it, the clinical pharmacist coordinates with external laboratory locations to help reduce patient exposure and travel to the hospital or outpatient practice. The clinical pharmacists embedded in gastroenterology practices can significantly deliver value-based clinical care. These benefits include relating to patients' concerns of immunosuppressive therapies, optimizing medication adherence and overseeing medication access. At a time when COVID-19 has caused staffing changes and even deployment of gastroenterologists to COVID-19 inpatient services, having clinical pharmacists dedicated to these tasks permits the continuous delivery of optimal patient care for patients with IBD. As a member of the gastroenterology team, the pharmacist's role is multifaceted. It includes managing self-injectable biologic agents, resolving medication-related insurance coverage issues, providing patient education on the proper use and administration of biologic agents and assisting with patient scheduling of infusions and with training about COVID-19 as it relates to IBD [24,25].

Specific drug-focused interventions-Clozapine and tocilizumab

Certain drug therapies need pharmacist's special attention, for a better outcome with reduced adverse events. Zuckerman AD., *et al.* implemented one of such drug-focused interventions on tocilizumab, the Interleukin-6 Receptor Antagonist, which is under investigation of COVID-19 patients. All requests of tocilizumab are reviewed can only be approved through a "pharmacy, therapeutics, and diagnostics committee," where pharmacists have a major role. Likewise, in the United States, Risk Evaluation and Mitigation Strategy (REMS) monitoring programs for those prescribing Clozapine made proactive in coordinating with pharmacies to ensure clozapine therapy continues uninterrupted due to COVID-19 pandemic barriers. Since there is no specific indicated drug for the virus, many medications are involved in management. So definite roles of pharmacists like in Clozapine and Tocilizumab can be copied to other drugs too [26,27].

Expert pharmacist forum's opinions on cancer patients during the COVID-19 pandemic

Cancer patients may be at higher risk for developing severe COVID-19; with this in view, many organizations recommended guidelines where pharmacists need to attend to the safety of patients.

Saudi oncology pharmacy assembly experts recommendations

The Saudi oncology pharmacy assembly had issued guidelines to reduce the frequency of cancer patients' visits to oncology hospitals during the Pandemic while maintaining the access to cancer therapy and reducing the risk of exposure to coronavirus disease. The recommendations include:

- Delaying adjuvant chemotherapy within the recommended range of treatment initiation.

- Using extended dosing schedule of cancer therapy.

- Switching from intravenous chemotherapy to oral or subcutaneous route of administration.

- Home administering chemotherapeutic agents and supportive care therapy.

- Prolonging stem cell transplants if medically advisable.

- Considering intermittent chemotherapy or treatment discontinuation for eligible recipients.

- Activating telemedicine for managing stable cancer patients on oral chemotherapy.

- Applying proactive measures to minimize patients visits to the pharmacy [28].

French society for oncology pharmacy guidelines

Due to greater susceptibility and unprecedented impact of COVID 19 in cancer patients, the French Society for Oncology Pharmacy proposed adjustments and alternative options on the international guidelines to cancer care to limit hospital contact and cytopenic treatment in cancer patients. The society pointed out the leading risk of drug-related problems as well as adverse events and drug-drug interactions due to polypharmacy. Recommended to take appropriate alternative pathways to reduce contamination, also cautions about interactions between anticancer and viral experimental drugs [29].

Global oncology pharmacy response to COVID-19 pandemic: Medication access and safety

The global oncology pharmacy perspective (including both developed and developing nations) on how COVID-19 has impacted access to and delivery of cancer therapies by the International Society of Oncology Pharmacy Practitioners is revealed in a survey among national and regional oncology pharmacy practice groups (42 practice leaders from 28 countries and regions). Specifically, it highlights challenges related to the safe handling of hazardous drugs and maintaining high-quality medication safety standards, which have impacted various stakeholders [30].

Extended vigilance on ADR monitoring and prevention

Pharmacists being the drug experts have the central role in ensuring drug safety by detecting and reporting adverse drug reactions (ADR). Off-label drug use may raise greater potential drug use risks. Pharmacists emphasize on adverse drug reactions, use the Adverse Drug Reaction monitoring system of medical institutions to monitor the adverse reactions of off-label drugs, and evaluate the causal relationship of adverse drug reactions. The incidence of severe ADR in off-label using was significantly higher than normal use, such as anaphylactic shock, drug-induced liver damage, and induced epilepsy, which was prone to occur in off-label drug use cases. Ying W., *et al*. observed that pharmacists monitored ADR, evaluated and analyzed the symptoms of patients, and provided doctors with ADR informa-

tion; participating in the multidisciplinary diagnosis and treatment of COVID-19 patients; participating in multidisciplinary consultations; watching drug interactions, implementing remote pharmaceutical services; and caring out medication reviews. Pharmacists also issued a list of common risk warnings of potential drug interactions and reactions according to COVID-19 diagnosis and treatment plans combined with works of literature [31].

Drug-drug interactions-management during COVID-19, co-morbid and polypharmacy scenario

One of the other major challenges is the prevention and management of drug interaction, especially in COVID-19 patients with comorbidities. Lemaitre F., *et al.* provided practical recommendations on managing the identified possible or confirmed risk of two or more than two drugs used for the most common chronic diseases and those currently offered as a treatment for undergoing therapeutic trials for CO-VID-19. This article highlighted the clinically relevant drug-drug interactions between COVID-19 related drugs and those used in patients suffering from other diseases, which include hydroxychloroquine, viral RNA polymerase inhibitors: favipiravir and remdesivir, HIV protease inhibitors: lopinavir/ritonavir (lopinavir/r), interferon, interleukin-6 (IL-6) inhibitors: tocilizumab and sarilumab, azithromycin, baricitinib, NSAIDS's and paracetamol, opioid analgesics, anticoagulants, and antiplatelet drugs, lipid-lowering drugs, anti-hypertensives, heart failure drugs, angina pectoris drugs, anti-arrhythmic drugs (AADs) and oral anti-diabetics [32].

Critical supports for critical patients

Pharmacists perform a key role in ICUs by handling medication within the complexity of different routes of administration and critically and rapidly altering pharmacokinetic and dynamic parameters and managing extremes of physiology in critically ill patients. Borthwick M., *et al.* shared their clinical experiences on medication optimization and provided a practicable reference for the pharmaceutical care for COVID -19 patients with critical clinical conditions. The rapid response of the clinical pharmacist's intervention in the management of critically ill patients to combat the Pandemic with extensive ward participation increased substantially. Clinical recommendations by pharmacists among the medical team, especially on anti-infective agents, received great attention and acceptance in COVID 19 cases. These clinical pharmacists researchers proved that their influence during COVID 19, along with the recommendations mentioned above and in the prevention of ADRs, could be used as a resource to other institutions. Borthwick M., *et al.* demonstrated a new organizational design, in which more pharmacists joined the existing critical patient pharmacist team to facilitate and improve critically ill patients. Besides, they created the Immuno-COVID Committee, in which they worked with multiple specialists to achieve the best therapeutic decision-making in the most complex cases in the ICU [33].

Cardiology care by pharmacists during COVID-19

Pickworth KK., *et al.* commended the role of cardiology pharmacists in making guidelines to address the monitoring of QT-prolonging medications. Pharmacists can create a brief of patient medication profiles and recommend discontinuing unnecessary QT-prolonging medications to lessen the risk. Literature supported the use of angiotensin-converting-enzyme inhibitors/angiotensin II receptor blockers (ACEI/ARBS) in various cardiology disease states, and inhibition of the renin-angiotensin-aldosterone system in most cardiology disease states had positive outcomes. These agents have been protective of end-organ damage. These interventions are supported by a joint statement from the Heart Failure Society of America and the American Heart Association that ACEI should not be discontinued in patients with COVID-19. As cardiology pharmacists review home medications, they are in a unique position to prevent stopping of these life-altering medications, unless necessary due to hemodynamic or renal complications. Pharmacists provide education to medical staff and patients on this issue so that ACEI/ARBs, which are the cornerstone of cardiac care, are not inadvertently discontinued, resulting in an influx of decompensated patients entering the health care system during the Pandemic [34]. A study by Tan SL., *et al.* demonstrates the management and recommendations on warfarin dose adjustment to 500 patients via a mobile phone app by a pharmacist [35].

Clinical pharmacist driven telehealth services

Telehealth is the best way to overcome the challenges of social distance protocols during the Pandemic. Segal EM., *et al*. highlighted the implementation of pharmacist-mediated telehealth services. This virtual process involves credentialed pharmacists, who completed training modules successfully implemented telehealth visits. New technology platforms, resources and workflows were used to facilitates providers and patients. The authors highlighted the importance of consent and documentation components crucially important to the telehealth. Major challenges and limitations discussed on pharmacist services via telehealth [36].

Chronic kidney disease management supported by pharmacists care during COVID-19

Patients with CKD are one among the most susceptible to the Pandemic due to negative health outcomes that are associated with poor management of the disease, which may be exacerbated by the Pandemic. Okoro RN., *et al*. state the factors responsible for the increased risk of patients with CKD for COVID-19 infection and mortality include two main target receptors (human angiotensin-converting enzyme-2 [ACE2] and human dipeptidyl peptidase-4 [DPP4]) of COVID-19, which help its entry into the human body, which are highly expressed in the renal tubules; glucocorticoids and immunosuppressants therapy for patients with CKD secondary to glomerular disease with the attendant consequence of an impaired immune system and increased susceptibility to COVID-19; possible damage to several small arteries and capillaries in the kidney by COVID-19; and kidney damage by COVID-19 and the inflammatory cytokines as blood passes through the kidney. Dialysis patients with CKD constitute a more susceptible population because they are frequently exposed to a possible contaminated environment due to multiple dialysis sessions per week. The authors recommend pharmacists to extend their service during this Pandemic including medication supply and critical personal protective items, provision of reliable and timely patient medication counseling, home delivery services, telepharmacy services, and adherence support [37].

Drive-through anticoagulation clinics during COVID-19 pandemic

Unfortunately, the most important precaution, the social distance during Covid-19, potentially limited the mandatory frequent follow-ups of chronic anticoagulation patients with atrial fibrillation, venous thromboembolism, or valvular heart disease in hospitals. To bridge the gap of continuity of care and preservation of social distancing precautions, a healthcare team consisting of vascular medicine physicians' and pharmacists implemented a dedicated drive through the anticoagulation clinic program. The specially trained pharmacist was one of the key parts of this pilot study. The researchers concluded that the effectiveness of this teamwork intervention on ACC patients was successful [38]. Similar extended drive-through approach was established in Qatar also. The existing pharmacist managed ACC clinic restructured as drive-through service to keep a safe atmosphere. Even after various challenges, authors got patients accepted and good outcome [39].

Conclusion

Many studies illustrated the clinical roles of pharmacists in response to COVID19-related challenges and the necessity of value-added patient-centered active services. In managing public health emergencies during COVID-19, using their professional expertise, clinical pharmacists did major roles in areas such as cardiology, endocrinology, gastroenterology, adverse drug reaction, drug interaction, psychiatry, oncology, anticoagulation clinic, etc. Bringing attention to all such interventions in front of pharmacy professionals surely boosts the profession's scope and public health. Responsible authorities can assess the impact of the pharmacists' clinical role in current situations periodically and guide to enhance the scope of the clinical pharmacist's service to ensure the rational use of medications in different patient/drug/disease groups globally.

Conflict of Interest

None.

Funding

None.

Conflict of Interest Disclosures

All five authors have nothing to disclose.

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Volume 8 Issue 12 December 2020