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Structural and operational redesigning of patient-centered ambulatory care pharmacy services and its effectiveness during the COVID-19 pandemic

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ARTICLE INFO

Keywords:

COVID-19
Ambulatory care
Structural changes
Drug management
Access to medication

ABSTRACT

Background: The newly emerged coronavirus pandemic (COVID-19) has collapsed the entire global health care system. Due to these settings, a lot of strategic changes are adopted by healthcare facilities to ensure continuity in patient-centered services.

Objective: This study aims to evaluate the effectiveness of structural and operational changes made in ambulatory care pharmacy services during the COVID-19 pandemic.

Methods: A retrospective comparative study was conducted to evaluate the impact and effectiveness of patient-centered interventions and consequent access to medication management care within Johns Hopkins Aramco Health Care ambulatory care pharmacy services during the COVID-19 pandemic by comparing patient-centered key performance indicators before and during COVID-19 pandemic for a total of 4 months.

Results: As a result of the structural and operational changes made in patient-centered ambulatory care pharmacy services during the COVID-19 pandemic, a 48% prescriptions requests and 90% prescriptions fills are increased through online health portal application. A three-fold increase in the pharmacy call center utilization resulted in around 10% abandoned calls. In the number of physical visits to ambulatory care pharmacies, a 37% reduction was also noted. The decrease in staff schedule efficiency and an increase in average prescription waiting time were also noticed. The prescription collection through remote area pick up locations, and medication home delivery services were successful during COVID-19 pandemic as supported by statistical data.

Conclusion: The access to ambulatory care pharmacy services during COVID-19 pandemic has been successfully maintained via medication home delivery, remote area pickup locations, pharmacy call-center consultations and refill requests, online health portal application services, and other measures, while reducing the number of physical visits to the JHAH hospital/clinic to ensure compliance with infection control and prevention measures.

Introduction

The newly emerged coronavirus disease (COVID-19) pandemic has led to the collapse of the entire global health care system by infecting, as of June 6, 2020, more than 6.8 million people, with almost 400,000 deaths.¹ On March 11, the World Health Organization declared COVID-19 a global pandemic.² On March 2, 2020, the Saudi Ministry of Health (MOH) announced the detection of the first case of COVID-19 in

the Kingdom of Saudi Arabia.³ The Saudi Arabian government and the Saudi MOH have taken proactive steps to implement sustainable measures to prevent and control the spread of COVID-19. The National Centers for Disease Prevention and Control (Weqaya) has highlighted that specific patient populations are at higher risk for developing COVID-19; these populations include the elderly and patients with diabetes, heart disease, immunodeficiency conditions, and lung disease.⁴ Other susceptible populations include pregnant and breastfeeding

Abbreviations: COVID-1, coronavirus disease; MOH, Ministry of Health; JHAH, Johns Hopkins Aramco Healthcare.

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<https://doi.org/10.1016/j.sapharm.2020.06.017>

Received 19 June 2020; Accepted 20 June 2020

Available online 23 June 2020

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women, homeless individuals, and racial and ethnic minority groups. A wide range of symptoms is associated with COVID-19, from mild to severe. The most prominent symptoms of COVID-19 are cough, shortness of breath, fever, chills, muscle ache, sore throat, headache, and a loss of taste or smell. Symptoms may develop in 2 days to 2 weeks after exposure to the virus, although some reports suggest that the incubation period may last up to 24 days.⁵ Restrictive measures including a curfew, area lockdown, physical distancing, case detection via proactive testing, isolation, contact tracing, and quarantine have been adopted by the governments worldwide to limit the spread of the disease.^{6,7}

The COVID-19 pandemic has imposed a massive strain and challenges on the normal functioning of health care institutions worldwide. Special populations such as patients with chronic diseases are being affected due to social distancing and lockdowns to limit and contain the spread of the disease. They are unable to access healthcare facilities for routine care and medication management. The management of chronic conditions and the promotion of medication adherence during this pandemic is a burden on already strained health systems. To provide support for the World Health Organization's call to maintain essential services during the pandemic to limit non-COVID disease burden on healthcare systems is a challenging responsibility for each healthcare institution.⁸ The well-being of both patients and health care workers is the cornerstone of every well-functioning health care institution. Aligned with Saudi MOH directives, Johns Hopkins Aramco Healthcare (JHAH) is undertaking proactive infection control and prevention, including measures to safeguard operational readiness. Ambulatory care pharmacists are among the commonly accessible healthcare professionals to the public, and the chance of contact between these pharmacists and infected patients is very high. In response to a country's various preventative and public health measures, pharmacists can play a vital role amid the COVID-19 pandemic. Given the nature of ambulatory pharmacy as an essential health service, pharmacies are unlikely to limit services in any foreseeable lockdown scenario. JHAH has continued to provide patient-centered pharmacy services during the lockdown period in Saudi Arabia without jeopardizing the quality of care.⁹

However, the dramatic spread of COVID-19 has not yet been controlled, and no specific vaccine or medication has been proven to be completely effective. Furthermore, the overall spread of the virus worldwide has not declined, and the world continues to wait for a breakthrough vaccine, despite the unprecedented progress in COVID-19 vaccine development. Thus, COVID-19 remains a significant challenge in medical science. The effective functioning of the healthcare sector is crucial in this new world order because this sector is the primary defense against this fatal disease. Hence, the existing functioning of the healthcare system needs to be relooked at considering this new scenario. The mandatory protocols for the management of COVID-19 have disrupted the traditional operation of the health care system. As the disease continues to spread, even among health care workers, the pressure on the global health workforce is intensifying, and the uncontrolled growth in the number of COVID-19 patients is testing the threshold of the health care capacity.¹⁰

Limiting the spread of disease and ensuring the continuity of patient-centered care by safeguarding the well-being of both patients and healthcare staff is a massive challenge in every healthcare institution.¹¹ Many COVID-19-related guidelines^{12–14} and articles are available as references for the pharmacy department, most of which are either commentaries, viewpoints, action plans, and recommendations.^{15–17} Herein, we present the COVID-19 pandemic response plan of the JHAH ambulatory care pharmacy department. We also evaluated the impact and effectiveness of patient- and person-centered interventions and consequent access to medication management care within JHAH ambulatory care pharmacy services during the COVID-19 pandemic by comparing patient-centered key performance indicators before and during COVID-19 for a total period of 4 months. To the best of our knowledge, no other data-supported study is available to compare the effectiveness of structural and process changes of Ambulatory care

pharmacy services during the COVID-19 pandemic.

Setting and practice description

JHAH is an integrated healthcare network, including a 330-bed tertiary care hospital, responsible for the provision of healthcare to approximately 360,000 beneficiaries. It comprises an ambulatory medication management outpatient service that provides healthcare facilities for approximately 1.5 million outpatient visits per year, with 2.4 million medication prescriptions dispensed annually. JHAH is accredited by both the Joint Commission International and the Saudi Central Board for Accreditation of Healthcare Institutes. It has been awarded gold certification for excellence in person-centered care by Planetree International.¹⁸

By pairing a patient-centric physical design with state-of-the-art robotic technology for outpatient medication management, JHAH ambulatory care pharmacies have become one of the few pioneers to develop a system focused on a patient-centric culture of safety in the Middle East. JHAH ambulatory care pharmacies integrate two different outpatient robotic dispensing technologies (Consis® for commercial packs and Parata® for loose tablets) with an electronic healthcare host system for outpatient medication management (Epic®). The success of this model has led to its application in all JHAH ambulatory pharmacy locations, resulting in an increase in patient and staff satisfaction, an increase in patient counseling manifested by an increase in clinical interventions, and a decrease in patient waiting time and dispensing errors.

JHAH offers to its beneficiaries an online health portal, MyChart™, which offers easy access to various services such as booking appointments, looking up test results, and requesting medication refills.¹⁹ MyChart™ enables eligible beneficiaries and their family members to electronically request and arrange for medication refill dispensing from all pharmacy pickup locations to ensure access to care. JHAH also provides call-center pharmacy services through an interactive voice response system. This service allows patients to discuss their medication management requests with pharmacist operators who can counsel patients and to request and arrange medication refill dispensing. In addition to its 23 physical pickup locations, JHAH ambulatory care pharmacies manage pharmacy-operated clinics such as medication management clinics and anticoagulation clinics. The medication management clinic is a patient-centered, outcome-oriented interdependent practice managed by pharmacists that requires the pharmacist to work in collaboration with other healthcare providers and the patient, so as to ensure appropriate medication therapy and medication order extension under a collaborative agreement. The anticoagulation clinic is a patient-centered, outcome-oriented interdependent practice managed by pharmacists where the pharmacist reviews the oral anticoagulant medication profile and parameters, and provides instant International Normalized Ratio (INR) testing, dispensing, and appropriate counseling to ensure optimal therapy.

To complement the person-centered interventions, both patient satisfaction and staff engagement data are collected electronically, measured, and benchmarked against regional providers by Press Ganey™ in collaboration with the JHAH Service Excellence group since August 2016.²⁰

Practice innovation during COVID-19

Person- and patient-centered interventions applied within JHAH ambulatory care pharmacy services due to COVID-19 pandemic include the following: (I) General pharmacy infection control and prevention measures, (II) access to medication management care measures, (III) business continuity and staffing measures, and (IV) medication automation-related measures.

General pharmacy infection control and prevention measures

- Nurses screen all patients, patients' family members, and JHAH staff upon entry into the pharmacy and before accessing any patient waiting areas. This infection prevention screening consists of the application of hand sanitizer; answering of questions related to travel history; temperature measurement; and a verbal assessment for symptoms, including cough, shortness of breath, and fever.²¹
- In the patient waiting areas in the pharmacy, all chairs have been relocated to ensure proper physical distancing, easy-access hand sanitizer dispensers have been installed, and area TV screens have been modified to display hand hygiene videos.²²
- At the pharmacy dispensing counter, only one chair has been maintained per station, with a proper physical distancing from the counter and a floor marking.²³ All pharmacy staff are mandated to wear surgical masks along with face shields.²⁴
- All pharmacy staff are mandated to complete three online COVID-19-related courses via the JHAH electronic learning portal.²⁵

Access to medication management care measures

- Electronic communication methods are being used to advise and encourage all eligible patients to visit the JHAH pharmacy remote pickup location nearest to their work or residence to avoid unnecessary visits to the JHAH hospital and clinic buildings.²⁶
- In addition to the existing 23 JHAH ambulatory pharmacies and remote pickup locations, and to accommodate government-imposed lockdowns in specific areas,²⁷ JHAH has added three new temporary pickup locations within areas with a lockdown. All new three locations have been equipped with remote-access laptops to ensure access to electronic health care records, verification, and dispensing for eligible patients in the area who are unable to exit or enter the lockdown area. Patients' medication orders and refill requests made electronically and by calling the pharmacy call center are managed daily from the hospital ambulatory care pharmacy and shipped daily in a vehicle with police clearance to enter and exit the lockdown area.
- JHAH enables eligible patients to request refills of existing medications electronically via the MyChart™ application or by calling the centralized pharmacy call center. In both cases, patients can select any of the 26 pickup locations (including the new 3 temporary locations).¹⁹
- MyChart™ application access is available to JHAH's eligible patients, and requests for refills of existing medication orders or communication requests to clinicians can be made around the clock. The centralized pharmacy call center is accessible on weekdays during regular working hours.¹⁹
- A new anticoagulation pharmacist-operated clinic has also been established in lockdown areas. In this center, the pharmacist reviews the oral anticoagulant medication profile and parameters, provides instant INR testing, dispensing, and appropriate counseling to ensure optimal therapy for patients affected by the lockdown.
- On April 20, 2020, JHAH ambulatory care pharmacy services launched a pilot home delivery process to cater to cancer patients or patients aged above 60 years for due medication refills via a third-party courier provider. Requests received via the centralized pharmacy call center on business weekdays are delivered on the next working business day.
- All new services, locations, and operational hours are advertised via SMS services, the JHAH website, and JHAH social media pages.

Business continuity and staffing measures

- Pharmacy management actions are integrated with daily, JHAH institutional planning. Strategies for staffing, alternate care sites, re-assignment, and stocking of critical medications have been

established in line with the directives of the JHAH management and COVID response team.

- Pharmacy management monitors key performance indicators of core operations daily to adjust plans as necessary.
- Pharmacy employees with medical conditions specified by the JHAH human resources department and Saudi MOH guidelines have been temporarily released from work under a "special medical leave."
- Pharmacy operations are limited to core activities. Non-urgent meetings, committee sessions, educational activities, business assignments, and non-urgent audits have been postponed or conducted via teleconference.
- Adequate supplies of essential pharmaceuticals as identified by the JHAH supply chain policy are monitored daily and ensured under the pharmaceutical supply unit operations. Measures such as expiry extensions approved by the JHAH Pharmacy and Therapeutics Committee have been considered for out-of-stock critical medications for which no therapeutic equivalents are available.
- Staff schedule rotations are applied.
- Pharmacists have been relocated to maximize the capacity of the centralized pharmacy call center. The number of agents has been increased from one full-time agent plus 2 backup agents to 6 full-time agents plus 2 backup agents.
- The staff are encouraged to use the JHAH-established emotional-support helpline operated by mental health specialists.²⁸

Medication automation-related measures

- Utilizing JHAH's electronic healthcare host system for outpatient medication management (Epic Willow Ambulatory ®), an electronic banner and a report have been created to help users identify patients who have been confirmed or suspected to have COVID-19.
- A report for medication "Due Refill" prescriptions has been electronically built to anticipate and reduce refill medication visits and identify candidates for the medication home delivery service.
- An electronic best practice advisory alert has been created for ambulatory prescribing of chloroquine and hydroxychloroquine paired with the diagnosis to prevent off-label use.
- New workflow and virtual build have been developed for the home delivery service and the three new pickup locations within JHAH's electronic healthcare host system for outpatient medication management (Epic® Willow Ambulatory).

Methods

Study design

A retrospective, comparative study was conducted to evaluate the effectiveness of patient and person-centered interventions, and consequent access to medication management care during the COVID-19 pandemic by comparing data before and during the pandemic for a total period of four months at Johns Hopkins Aramco Health Care (JHAH) (two months before the pandemic - January and February 2020, and two months during the pandemic - March and April 2020). Although the number of working days did not exactly match the data before and during the COVID-19 pandemic, the comparison was made on two months of accumulated data before and during the COVID-19 pandemic, because the number of working hours was equal at both times due to reduced working hours in the lockdown period.

Data collection and description

- I. The following data were collected and retrieved electronically from electronic healthcare records (Epic) and the Cisco™ call center dashboard (for two months before the pandemic - January and February 2020, and two months during the pandemic - March and April 2020).

- Total number of patient calls to the centralized pharmacy call center to request refills, including the number of handled calls and percentage of abandoned calls.
 - Number of patients who utilized the electronic MyChart™ mobile/desktop application service, and the resulting number of prescriptions collected at all remote pickup locations
 - Number of patients and prescriptions picked up in three, new, temporary pickup locations within the lockdown areas
 - Total number of patients, including patients who utilized MyChart™ mobile/desktop application service, and patients who physically visited the ambulatory care pharmacies at JHAH hospital/clinic.
 - Number of patients who physically visited the ambulatory care pharmacies in JHAH hospital/clinic, and the subsequent number of face-to-face physically dispensed prescriptions
 - Pharmacy unit staffing efficiency upon implementation of rotation schedules, and impact on prescription waiting time
- II. The number of home delivery medication requests was collected and retrieved electronically from electronic healthcare records (Epic) and the Cisco™ call center dashboard weekly, following the implementation of the service on April 20, 2020

Results and discussion

Comparison of key performance indicators before and during the COVID-19 pandemic

To assess the impact of critical operational changes in ambulatory care pharmacy services during the COVID 19 pandemic at JHAH, four months of data were retrieved electronically and compared during (March and April) and before (January and February) the COVID-19 pandemic with respect to certain patient-centered parameters.

The total number of calls received by the pharmacy call center two months before the COVID-19 outbreak (January and February) was 5112 calls, and 21,674 calls were received during the COVID-19 outbreak in March and April. When compared to before pandemic 324% increase in calls was noted during the pandemic outbreak. Out of this total, 4800 call requests were processed before COVID-19, versus 19,707 calls requests in March and April. The percentage increase was 311% during the COVID-19 outbreak. Patient preference for remote access medication management solutions is reflected by the high percentage increase in the total number of pharmacist-handled call center requests for medication order renewal and refills in March and April compared to the previous two months.

An increase in the percentage of abandoned calls was noted due to the high volume of calls during the COVID-19 pandemic. This resulted in 1962 abandoned calls during the outbreak versus 312 calls before the COVID-19 outbreak. The percentage of abandoned calls was 9.98% during and 6.50% before the COVID-19 pandemic. This increase triggered the JHAH ambulatory pharmacy service to expand its centralized call center with five additional relocated pharmacist agents. Rim et al. conducted a similar study in May 2018 as an implementation and quality assessment of pharmacy call center services.²⁹ They noted improved patient experience, efficiency, and quality after the implementation of pharmacy call center services. Legenza et al. conducted a study in 2019 to assess the perceived workload in academic health center community pharmacies before and after implementation of a central call center.³⁰ In the current study, the effectiveness of pharmacy call center services before and during the COVID-19 pandemic was compared. Through the pharmacy call center, additional patient-centered services like patient counseling, medication renewal requests, and medication pick up requests through geographically distributed remote pick up locations were provided. These interventions led to a reduction in the number of physical visits to the JHAH hospital/clinics for medication-related purposes during the COVID-19 pandemic.

The number of MyChart™ electronic application requests was 9156

in January and February before the outbreak and 13,518 requests in March and April during the COVID-19 pandemic. This resulted in a 47.64% increase in the utilization of MyChart™ electronic application during the Covid-19 pandemic. The number of prescriptions dispensed through MyChart™ was 20,328 prescriptions before and 38,630 prescriptions during the COVID-19 pandemic, which reflects a 90% increase in the number of prescriptions during Covid-19 pandemic when compared to January and February before the outbreak. The remote pickup locations (where prescriptions are prepared in the JHAH hospital pharmacy and shipped by vehicles the next business day) reduced the number of patients who physically visited the ambulatory care pharmacies located in the JHAH hospital/clinic during COVID-19 pandemic.

The number patients visited JHAH hospital/clinic pharmacies was 96,763 before, and 61371 during the COVID-19 pandemic. The fewer patients were reflecting the patient's preference to avoid physical visits to the JHAH hospital/clinic pharmacies, and rather have a MyChart™ pick up. When compared to before outbreak, a 36.57% decrease in number patients visit to JHAH hospital/clinic pharmacies was noted during the COVID-19 pandemic.

The study also noted a decrease in the total number of patients, including patients who visited the JHAH hospital/clinic and MyChart™ prescription pick up during the outbreak. The total number of patients was 105,919 before and 74,889 during COVID-19, representing 29.29% decrease in the number of patients during the COVID-19 pandemic (see Fig. 1).

Staffing schedule efficiency and average prescription waiting time

The pharmacy staffing schedule efficiency is a percentage of the actual "on duty" staff divided by the budgeted total full-time equivalent (FTE) staff. Staffing schedule efficiency was 80% in January and February, and due to staffing rotation interventions during the COVID-19 pandemic, was 58% in March and 64% in April (Fig. 2). The average prescription waiting time was 3.1 and 3.3 min in January and February, respectively. In March and April, the average waiting time was increased to 8.3 min and 13 min, respectively, due to a decreased number of on-duty staff as a consequence of COVID-19 pandemic staff rotation recommended by the Saudi MOH. Loh et al. conducted a study on patient waiting time at an ambulatory pharmacy.³¹ In their study, the waiting time was influenced by the number of pharmacy staff, the number of pharmacy counters, the number of prescriptions, and the number of refill prescriptions.

Staff schedule rotations and allocations were applied to reduce the number of available staff per pharmacy unit to enable appropriate physical distancing and to cater for the expanded staffing needs of the call center and the additional temporary pickup locations. Although this intervention was successful in addressing the increased demands on the pharmacy call center and additional pickup locations, it did cause an increase in the prescription waiting time for patients who chose to visit the JHAH pharmacy locations physically.

Temporary prescription pick up locations within the lockdown areas

When the Saudi Arabian government imposed complete lockdown in a specific area that incorporated thousands of JHAH eligible patients, the JHAH pharmacy service department implemented three new temporary pickup locations in the quarantined region.²⁷ This service was started with a single pick up location, and due to higher positive responses received from patients of first pickup location, JHAH pharmacy management expanded the service with an additional two pick up locations. The medication refills were prepared based on call center patient requests and shipped daily to the new, remote locations. Between March 11 and April 30, 19,806 medications were delivered to 3760 patients (Fig. 3). This patient-centered intervention ensured continuity of medication management and care of the eligible patients within the quarantined zones.

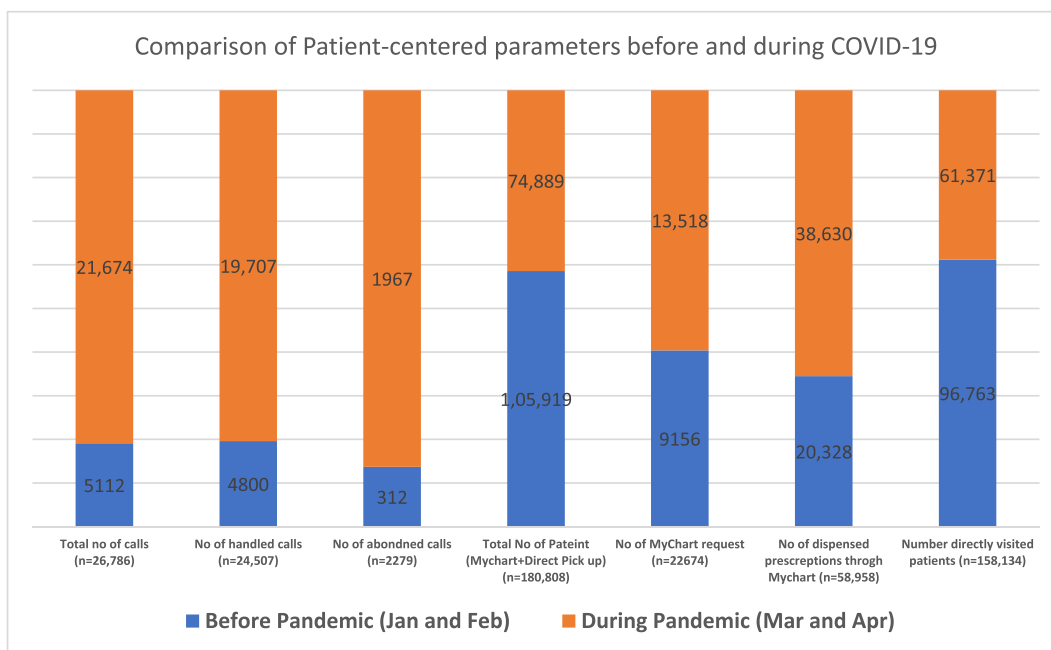


Fig. 1. Comparison of patient-centered Key performance indicators before (January and February) and during (March and April) COVID-19 pandemic.

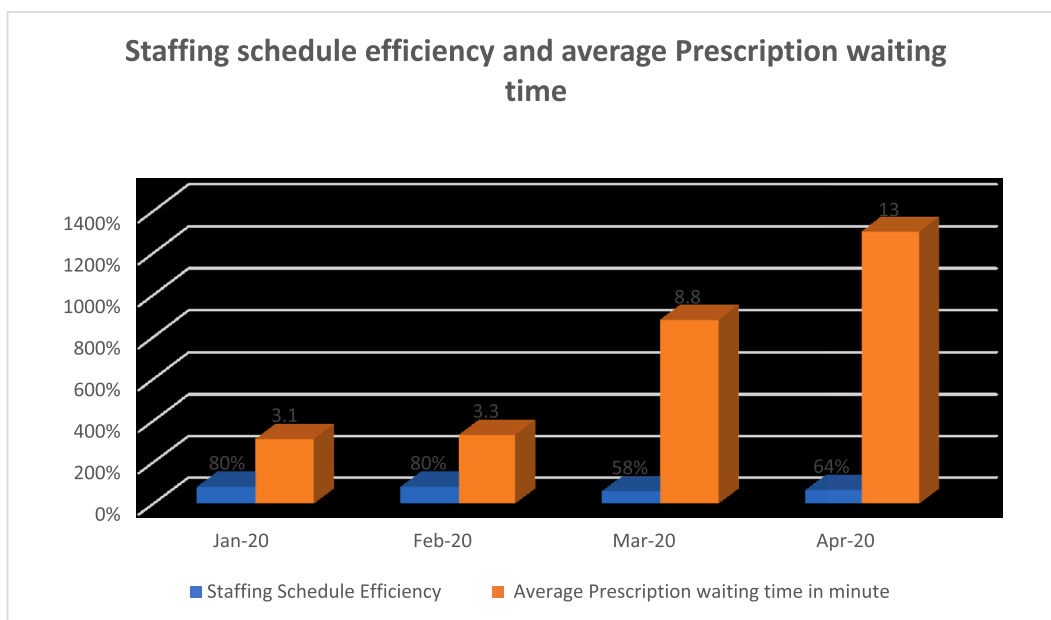


Fig. 2. Staffing schedule efficiency and average prescription waiting time before (January and February) and during (March and April) COVID-19 pandemic.

Medication home delivery service during the COVID-19 pandemic

The JHAH ambulatory care pharmacy services launched on April 20, 2020 as a pilot home delivery service (via a third-party courier) for cancer patients or patients above 60 years of age with medication refills. Requests received via the centralized pharmacy call center on business weekdays (Sunday to Thursday from 0700 h to 1600 h) were delivered the next business day. Between April 20 and May 14, 1829 prescriptions were delivered to 349 geriatric and cancer patients. The number of patients that utilized home delivery services for medication, and the resulted number of prescriptions weekly is presented in Fig. 4. The success and patient feedback for this service are grounds for its future expansion.

Conclusion

Due to the COVID-19 pandemic, many strategic changes have been adopted by healthcare facilities and governments to ensure continuity in healthcare services provided in these settings. As part of this community, the JHAH pharmacy department has implemented structural and process changes at its staff and organizational levels as well as ambulatory care pharmacy services provided during this pandemic, with considerations made for the consequences of governmental decisions (e.g., curfew, areas in lockdown, and stoppages of transportation services), in order to ensure the continuity of healthcare services with infection control measures. These changes include but are not limited to encouraging JHAH's eligible patients to use electronic communication methods, increasing the capacity of centralized pharmacy call centers

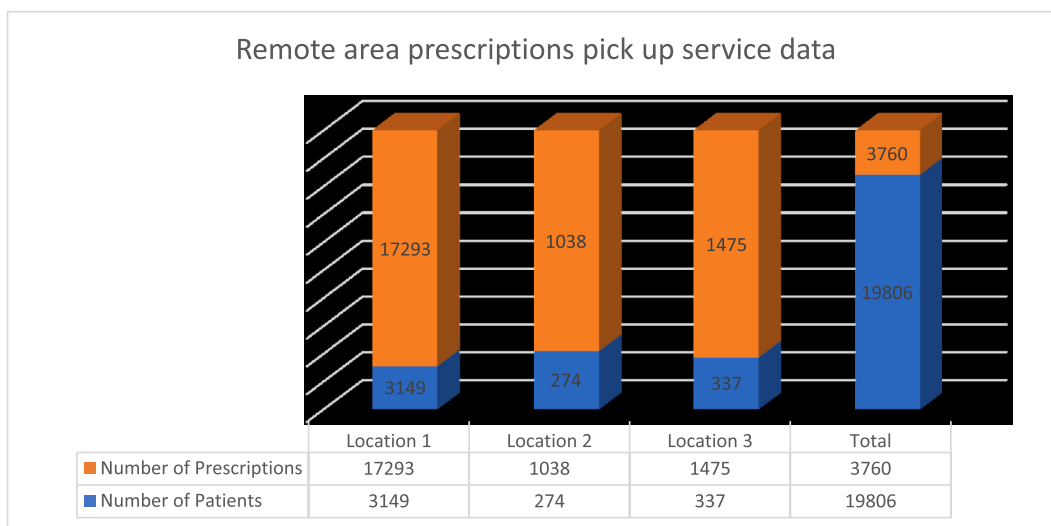


Fig. 3. The number of patients utilized remote area prescriptions pickup services and the resulted number of prescriptions during Covid-19 pandemic.

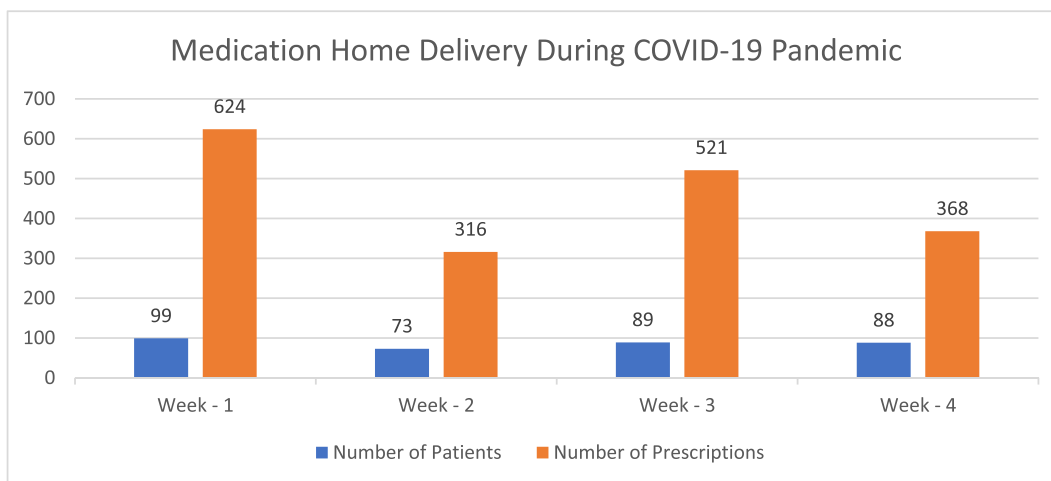


Fig. 4. The number of patients and resulted number of prescriptions delivered through medication home delivery services during the COVID-19 pandemic.

along with the associated prescription refill requests, and avoiding unnecessary visits to the JHAH hospital/clinics pharmacies. The changes also include encouraging patients to use the remote pickup locations of JHAH pharmacies, opening 3 new temporary pickup locations within lockdown areas, implementing staff rotations, and employing a medication-to-home delivery service. Although these changes have resulted in structural and procedural challenges for the JHAH system, they have proved useful in optimizing access to ambulatory medication management care for eligible JHAH patients within a patient and person-centered model.

The ambulatory care pharmacy department is leading person- and patient-centered interventions at JHAH during the pandemic as well as at remote locations for medication pickup in government-imposed lockdown areas. Furthermore, process and structural changes at institutional and staff levels are proving to be effective and reflect positively on patient access and continuity of medication management and care. JHAH has been successful in maintaining access to ambulatory medication management care during the COVID-19 pandemic for eligible JHAH patients through home delivery, remote pickup locations, consultations and refill requests via call centers, electronic refill requests via the health application MyChart™, and other measures, while reducing the number of physical visits to the JHAH hospital/clinic pharmacies to ensure compliance with infection control and prevention measures. The

COVID-19 pandemic has no borders, and the whole world is under immense pressure to limit the spread of this contagious disease. As the pandemic continues, institutions around the world should share their experiences and highlight areas for improvement to maintain and optimize access to medication management care to serve as references for other institutions.³²

Declaration of competing interest

None.

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