Adaptation of clinical pharmacy services to meet patient care needs during the COVID-19 pandemic

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Abstract
The coronavirus disease 2019 (COVID-19) pandemic caused by the severe acute respiratory syndrome coronavirus 2 has challenged health systems to find innovative ways of delivering patient care while protecting staff from infection with the virus. As the COVID-19 pandemic has continued to evolve establishing “hot spots” in various areas of the country, clinicians have learned more about caring for these patients. This has required the Department of Pharmacy at Thomas Jefferson University Hospital to constantly update the approach it has taken during this time, and the guidance which is provided for the pharmaceutical care of these patients. Because Philadelphia was in the initial stages of the pandemic within the United States, operations within the Department of Pharmacy at Thomas Jefferson University Hospital needed to be redesigned. This brief report provides an example of the swift changes that were made in the pharmacy practice model at a large academic medical center. Herein we describe the impact of the pandemic on the Department of Pharmacy at Thomas Jefferson University Hospital with a focus on clinical and operations aspects. The areas that will be highlighted in this report represent areas that required rapid and transformational change to the operations and/or clinical care in order to protect the health of pharmacists and allow them to continue to provide the necessary level of patient care.

KEYWORDS
communicable diseases, COVID-19, internship and residency, pandemic, pharmacists, pharmacy

The coronavirus disease 2019 (COVID-19) pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has challenged health systems to find innovative ways of delivering patient care while protecting staff from infection with the virus. The first person to be diagnosed with COVID-19 in the United States was reported on January 21, 2020. Within 2 weeks a total of 293 individuals from 36 states, the District of Columbia, and the U.S. Virgin Islands were patients under investigation. Initially, infections were centered in Seattle but shortly after, infections were identified in New York City, Northern New Jersey, and by March 10th in Philadelphia, Pennsylvania. The incidence of positive cases in Philadelphia was increasing at a rapid pace, with the 7-day average increasing from 7.7 cases/day on March 15, 2020 to 464 cases/day on April 9, 2020.2

Thomas Jefferson University Hospitals has 908 licensed acute care beds providing services at three hospital facilities located in Philadelphia. It is a Level 1 Trauma Center, a comprehensive stroke...
center, a National Cancer Institute (NCI)-designated cancer center, and a Federally Designated Regional Spinal Cord Injury Center. Thomas Jefferson University Hospital is the Academic Medical Center for Jefferson Health, a 14-hospital health system located in southeastern Pennsylvania and New Jersey.

The Department of Pharmacy at Thomas Jefferson University Hospital provides services using a centralized distribution model with decentralized patient care pharmacy services and has over 100 pharmacists and over 70 non-pharmacist staff. The Pharmacy Department has several American Society of Health-System Pharmacists (ASHP)-accredited residency programs and is a teaching site for the Jefferson College of Pharmacy.

This brief report provides an example of the swift changes that needed to be made in the pharmacy practice model at our large academic medical center while maintaining a high level of patient care. Herein, we describe the impact of the pandemic on the Department of Pharmacy with a focus on clinical and operational aspects. The areas that will be highlighted in this report represent areas that required rapid and transformational change to the operations and/or clinical care in order to protect the health of pharmacists and allow them to continue to provide the necessary level of patient care. Because Philadelphia was in the initial stages of the pandemic within the United States, we want to share the lessons we learned with others.

1 | PHARMACY OPERATIONS AND PATIENT CARE

With the Centers for Disease Control and Prevention (CDC) issuing travel advisories and initial cases reported in New Jersey, our pharmacy leadership contacted department staff on March 4, 2020 to solicit travel plans. No prohibition on travel had yet been issued by our organization, but the management team needed to assess potential exposure risk as the case counts increased internationally, on the U.S. West Coast, as well as the Eastern portion in New York City and New Jersey, both of which are geographically close to Philadelphia. Responses indicated that our staff had booked travel to multiple nations and cities already defined by the CDC as high risk. Given our Department of Pharmacy does not have the bandwidth to afford losing numerous pharmacists for an extended period due to the pandemic, the management team took this information seriously.

In mid-March, as we contemplated whether a remote staffing plan would be operationally and politically practical, an article in the Journal of the American Medical Association (JAMA) reported that close to 9% of all COVID-19 positive infections in Italy were among health care workers, and up to 60% of all cases were characterized by “no symptoms,” “few symptoms,” or “mild symptoms.” A similar infection rate among our pharmacy staff would seriously threaten our ability to operate and provide both distributive and clinical services, especially because the asymptomatic nature of transmission was not widely understood in the U.S. at that time. Over the course of the next 4 days, as social distancing and shelter in place orders were announced across Pennsylvania, New Jersey, and New York City, a plan for remote clinical pharmacy services was developed and deployed.

As an initial step, pharmacy leadership contacted Intensive Care Unit Medical Directors to determine if remote rounding could be a viable option for their services. Physician leaders were supportive and described efforts already underway to limit the total number of clinical staff present on units and specifically on rounds. In many instances, the medical teams welcomed these conversations as it encouraged broader discussions on the logistics of providing care to patients during the pandemic. The Pharmacy Clinical Coordinator and Advanced Practice Pharmacists contacted each team to assess technical capabilities and feasibility of rounding remotely. Each team and respective pharmacist developed specific plans for Zoom (Zoom Video Communications, Inc.), Skype for Business (Microsoft Office Suite), and/or phone participation on patient care rounds. While some teams included the pharmacist during the entire duration of the rounds, other teams elected to review each patient’s medication therapies before and after rounds directly with the pharmacist, rather than conduct virtual rounds for the entire duration. Each method was documented and shared across the department so all pharmacists assigned to cover that team would be aware of the plan.

As these early plans developed, the pharmacy management team received numerous, independent requests from staff raising concern about specific department staff with underlying conditions or age stratification placing them at risk for severe disease should they become infected; we moved these individuals to remote assignments immediately given the risk. Each individual to be moved to remote work successfully tested remote order verification capabilities, and some pharmacists without access to a personal computer had a hospital-issued laptop.

Pharmacy leadership also identified roles that could not be performed remotely. These roles included pharmacy technicians, sterile product production staff, overnight staff, and pharmacists working in the centralized distribution area. A base, onsite staffing model was built, onto which was added a two-week, onsite rotation for the clinical pharmacists to allow home sequestration for periods long enough to cover a period of quarantine should these individuals contract the disease. Our plan expected an infection rate similar to the Italian experience, and this rotation would potentially preserve clinical pharmacy services even in the event they were infected and working from home.

Because the Emergency Department (ED) was impacted early and severely by the pandemic, ED specialist pharmacists (first and second shift) remained onsite and remained in the ED for the entirety of their shift, wearing the full personal protective equipment (PPE) required of all staff in that location. Otherwise, their responsibilities did not change. We also assigned two Advanced Practice Clinical Pharmacists daily to work onsite to provide uninterrupted Code Blue response capabilities throughout the institution. Those pharmacists still responded to codes but, in accordance with strict response protocols adopted by the hospital, they were required to remain outside of patient rooms in all codes. The code cart also remained outside of the
room (in all but a few cases, as recommended by the code response team), and the responding pharmacists prepared medications and provided consultation to those inside the patient room via inside/outside mobile phone connection.

In order to facilitate communication between health care providers, each pharmacist was required to sign-in to the treatment team in the electronic health record (EHR, Epic (Epic Systems Corporation), with their name and phone number. The treatment team provides a list of health care providers that are participating in the care of the patient. Although the practice of signing-in to the treatment team was initiated prior to the pandemic, it was closely monitored for compliance during this time. In addition, communication between health professionals was encouraged through the use of the TigerConnect program (TigerConnect, Inc.), which allows for confidential patient information to be shared. Finally, in order to facilitate communication between pharmacists, each pharmacist was required to sign-in to Skype for Business. These various platforms facilitated effective communication between members of the health care team. Hospital-issued phones were forwarded to home phones for those deployed remotely. These strategies allowed secure direct phone communication to coverage phones, as if the pharmacists were onsite.

Remote employees were able to register their work hours with a remote Web Clock via MyTime (Melian Labs, Inc.), providing seamless integration with payroll. The pharmacy management team generated daily medication order verification statistics utilizing a QLIK (QlikTech International AB) data analytics platform to monitor remote and onsite productivity. We achieved a 2-minute reduction in “Time to Verify” medication orders with our hybrid onsite/remote model as compared with the pre-COVID era when all pharmacists were working onsite. In addition, in order to minimize medication passes for all patients and decrease the number of times the nurse must don PPE to complete medication administration, the pharmacy department took the initiative to bundle medication timing. As a result, the Pharmacy and Therapeutics Committee approved the extension of an existing protocol that allowed pharmacists to retimel antimicrobial medications to include the retiming of all chronic medications.

Pharmacists maintained their typical responsibilities as they transitioned to working remotely. This included obtaining medication histories, completing medication reconciliation, virtually rounding, and completing discharge medication reconciliation on those teams where this service was provided prior to the pandemic. Medication histories were obtained by calling the patient’s room directly. Discharge medication reconciliations were completed by phone with the medical teams or via the share screen function in Zoom. Using this feature, a Zoom invitation was sent to the provider, and the provider shared his or her screen so that the pharmacist could follow along as discharge medication reconciliation was completed. Several pharmacists were involved in transplant discharge teaching. To facilitate these counseling sessions, through the assistance of the patient’s nurse, a time was established for when the teaching would start. The patient was provided with a tablet computer (which were available prior to the pandemic) and the teaching was conducted via the Zoom software. This allowed the pharmacist to counsel the patient and observe as the patient was filling the pillbox.

Although at times there were challenges experienced by the pharmacists during the virtual rounds with the teams, including difficulty hearing the conversations, this model allowed for the pharmacists to provide nearly the same level of care as they provided prior to the pandemic. Initially, the hospital census was substantially lower than during typical times, which made this easier to initiate. When the hospital census began to increase, it became more challenging at times to continue to effectively participate on rounds. However, overall, the remote working model was successful and allowed our pharmacists to continue to provide effective patient care while mitigating personal risks associated with the pandemic. During the first wave of the pandemic, the remote working model was in place for approximately 3 months. Pharmacists were phased back onsite as the new pharmacy resident class was starting and pharmacists were asked to precept student pharmacists on clinical rotations.

During the remote working model, typical educational activities continued including resident continuing education (CE) presentations, monthly lunch and learn sessions during which a pharmacist presents a topic as part of the internal staff development process, preceptor development series, and resident case series where a pharmacy resident presents an interesting case. These activities were facilitated using Zoom. Of note, anecdotally, participation and attendance in these activities was substantially higher than when these activities were held in-person prior to the pandemic.

2 | ROLE OF INFECTIOUS DISEASE PHARMACISTS

The COVID-19 pandemic required rapid interdisciplinary collaboration across the health care divisions within the Jefferson Health system. Infectious Diseases (ID) clinical pharmacists, who were all working completely remotely, became key members of a multidisciplinary COVID-19 working group comprised of hospital administration and physicians across an array of specialties including ID, Critical Care, Hospital Medicine, Rheumatology, and Hematology. The working group was responsible for creating a COVID-19 treatment guideline for the hospital enterprise. ID pharmacists played an essential role in reviewing and interpreting literature on antiviral agents and immune modulators being used for management of COVID-19 infection. Additionally, ID pharmacists created educational resources on medication dosing, monitoring, precautions, adverse drug reactions, drug-drug interactions, and dose adjustments for special populations to assist clinicians in understanding and prescribing therapies within the guideline. On a weekly basis, the working group evaluated new data on evolving treatment options and updated guideline recommendations as appropriate.

One of the emerging treatment options for COVID-19 infection which presented a unique challenge for the working group was remdesivir (Veklury, Manufactured and distributed by Gilead Sciences, Inc., Foster City, California). Remdesivir is an intravenous antiviral
medication with in vitro activity against the SARS-CoV-2 virus by inhibiting viral RNA synthesis.\textsuperscript{4} Initially, remdesivir was available only in the setting of a clinical trial or as compassionate use for pregnant patients and children under 18 years with proven infection. The ID pharmacists assisted in procuring remdesivir through the compassionate use system for pregnant patients with COVID-19. This involved contacting the manufacturer, working with ID physicians to gather all necessary patient information, arranging for delivery and storage of the medication, and coordinating dispensing of it. It was also the responsibility of the ID pharmacists to contact the Institutional Review Board and confirm patient consent prior to initiating compassionate use therapy.

In May 2020, remdesivir received Emergency Use Authorization (EUA) from the Food and Drug Administration (FDA) to be used for the treatment of suspected or laboratory-confirmed COVID-19 infection and severe disease.\textsuperscript{5} This allowed our institution to access a supply of remdesivir which was initially very limited. The limited supply required the institution to create specific criteria for use, facilitated by the multidisciplinary working group with involvement of ethicists. Once specific guidelines for utilization were created based on current and constantly evolving literature, the ID pharmacists created a daily workflow to establish how eligible patients would be identified and selected for treatment with remdesivir. The ID pharmacists designed and ran reports in the EHR to identify potential qualifying patients and completed chart reviews of all pertinent vital signs and laboratory values to confirm eligibility. Once a patient was identified, the ID pharmacists contacted the primary team and ID team to coordinate patient consent, ordering of the medication, and all relevant labs. This was a service that was provided 7 days per week across the three hospital campuses. The workflow was also introduced and utilized by other hospitals in the health system. In addition, a remdesivir order set was created in the EHR to include correct loading and maintenance doses and duration of therapy to ease provider ordering. A system was established with the Investigational Drug Service (IDS) to track daily inventory of remdesivir. Lastly, it was the responsibility of the ID pharmacists to report required demographics and outcomes for patients treated with remdesivir to the state Department of Health. All medication-related adverse events were also reported to the FDA and to the institution’s internal adverse event reporting system. Educational memos were created and distributed to pharmacy and nursing staff regarding remdesivir indications, dosing, preparation, and dispensing.

The ID pharmacists were closely involved with pharmacy administration in managing inventory for COVID-19 therapies. In this role, ID pharmacists worked proactively to identify and mitigate drug shortages. Action plans for drug shortages were established that included formulary restriction criteria and electronic prescriber alerts for COVID-19 therapies in limited supply. During prospective antimicrobial stewardship audits, ID pharmacists monitored compliance with restrictions to ensure appropriate use and prolong supply. In situations where shortages and low inventory supply were a challenge, the multidisciplinary COVID-19 working group prioritized drug supply to patients who were most likely to benefit. Throughout the ongoing pandemic, ID pharmacists were a vital resource for other pharmacists, physicians, and nurses. They served as drug information experts and helped make system- and patient-level decisions.

Many valuable lessons were learned while practicing during the COVID-19 pandemic. These lessons included the importance of communication and need for rapid evaluation of medical information. With increasing expectations for clinical decision-making, clear and consistent communication was required in our multidisciplinary team approach for therapeutic guideline development, dispersion of information to staff, and education of front-line providers. The evolving therapeutic treatment options and limited availability of high-quality data made it prudent for enterprise ID pharmacists and physicians to meet on a weekly to more frequent basis to evaluate the literature to make safe and effective therapy recommendations.

### 3 | ONCOLOGY PATIENT CARE AND OPERATIONS

The oncology pharmacy team worked in collaboration with the Jefferson Home Infusion Service (JHIS) and Jefferson Specialty Pharmacy (JSP) to safely transition treatment of patients from the outpatient infusion center to home for administration during the COVID-19 surge. An example of changes required during the pandemic was changing the formulary default for the growth factor, peg-filgrastim-cbqv (Udenyca, Choherus Pharmaceuticals) to NeulastaOnPro (peg-filgrastim, [manufactured by Amgen Inc, Thousand Oaks, California]). Patients must return the day after receiving chemotherapy to receive peg-filgrastim as a subcutaneous injection. The initial step for oncology pharmacists included collaboration with the billing team to attempt to convert 65 patients from Udenyca to NeulastaOnPro (peg-filgrastim), which is placed on the patient the same-day of chemotherapy administration. The NeulastaOnPro auto injects peg-filgrastim the following day and would allow patients to stay home, minimizing exposure in the infusion center. Patients denied NeulastaOnPro by their insurance provider had an Udenyca prescription sent to JSP for a home administration option. For patients receiving 5-Fluorouracil (5FU) through a home infusion service, JSP delivered the prescription to the oncology infusion center to be sent home with the patient for JHIS to administer during the 5FU disconnect visit. Those patients not on 5FU were offered training by JSP to ensure they were properly educated on how to self-administer the Udenyca at home. Oncology pharmacists identified 131 patients that could be eligible for either delaying treatment, extending intervals/increasing doses, or having the patient receive support therapy at home either by JHIS or filled through JSP for self-administration, some of which is detailed above. JHIS took on an additional 19 chemotherapy referrals during this time from Medical Oncology through the at-home program established prior to COVID-19.

This was all accomplished while also having half of the oncology pharmacists working remotely. The clinical inpatient rounding pharmacists, ambulatory breast clinic pharmacist, and one oncology infusion pharmacist were all working remotely and coordinating closely
with each other and the entire medical team. Order verification, clinical rounding, and ambulatory clinic shifted virtually overnight to offer remote pharmacy services that interacted with patients, multi-disciplines, and took on additional responsibilities, assuring patient safety, satisfaction, and cohesiveness to the team. Inpatient clinical pharmacists utilized Zoom to round with the medical team and phoned into patient rooms for medication therapy management (MTM) and medication reconciliation. The ambulatory pharmacist conducted telehealth appointments with patients, coordinated with the billing team for reimbursements, and worked closely with providers to manage chemotherapy orders and facilitate delays. The remote infusion pharmacist’s primary role was to conduct order verification, complete checklists, and remotely check the final product via a camera safety checking system. Patients, caregivers, and employees expressed gratitude at the ability to continue a high level of service during a crisis.

4 | INVESTIGATIONAL DRUG SERVICES

The IDS pharmacy was an integral part of the COVID-19 pandemic response. A team of pharmacists was quickly assembled to focus solely on COVID-19 trials, while another team focused on current non-COVID-19 trials. The IDS pharmacists were part of an interdisciplinary core group formed to quickly evaluate and collaborate on feasibility of accepting the numerous new trials being presented for management of COVID-19 patients. The core group included IDS pharmacists, the Jefferson Research Institute members, and the EHR informatics team. Together, this group chose trials that were feasible to participate in and worked to expedite the EHR template and medication builds. Because these trials were in addition to the non-COVID-19 trials that were still open and enrolling during this time, an oncology pharmacist that was trained in IDS transitioned to work directly on COVID-19 trials. Two pharmacists were dedicated to COVID-19 trials while two others focused on non-COVID-19 trials. At the time of this writing, 10 individual COVID-19 treatment protocols have opened at Jefferson Health. To put this into perspective, it typically takes 4-6 months to open one clinical trial. By streamlining the approval process, EHR medication builds, and expedited completion of regulatory requirements, the first COVID-19 treatment trial was opened within an unprecedented 21 days. Without this designated multi-disciplinary team working around the clock, this would not have been possible. Hours of operation for IDS pharmacy were expanded by staggering shifts of staff to cover from 7 AM to 5 PM, Monday-Friday. The two pharmacists that were dedicated to COVID-19 also took weekly rotations alternating on-call support for times outside these hours and weekends. In addition, to be able to expand trials across Jefferson Health, pharmacists at other sites were identified and trained in the management of research studies. Of the total 10 studies opened for COVID-19, two were opened as multi-site locations throughout the enterprise.

In order to promote telehealth clinical appointments, IDS quickly established a process to ship oral investigational products directly to patient’s homes so they would not have to come to the hospital or clinic to pick-up an additional supply. This required researching state and federal laws/regulations and purchasing of shipping materials that would ensure the correct temperature was maintained during transport. In the last 4 months, IDS dispensed, packaged, and sent over 85 shipments to patients.

Upon the EUA approval of remdesivir by the FDA, IDS was also asked to support and maintain all drug accountability. To assure that the supply of remdesivir remained secure and the inventory was accurate, all doses are prepared by the IDS pharmacy. In collaboration with ID pharmacists, pharmacy residents, and the primary care-teams, IDS has been crucial in the treatment of patients with remdesivir.

5 | ANTICOAGULATION PRACTICES

During the initial stage of the pandemic spread to involve the Philadelphia area, our academic medical center instituted a command center, as is typically created for all emergency situations. The COVID-19 Command Center focused on an approach to efficiently utilize staff, equipment, hospital beds, and medication resources, with development of guidelines in these areas. Our antithrombotic therapy service team worked onsite closely with the command center throughout the pandemic period to develop guidelines and coordinate care of patients experiencing COVID-19 related thrombotic complications. Below is a summary of our lessons learned in the creation and refinement of COVID-19 associated anticoagulation practices.

5.1 | Guideline development and staff education

In order to familiarize reassigned medical personnel to critical care areas (ie, anesthesiologists) with applicable venous thromboembolism (VTE)-related order sets, policies, and guidelines, our antithrombotic clinical pharmacist created a VTE Resource Guide as a quick reference guide. This reference guide, as well as additional anticoagulation practice guidelines developed in conjunction with the COVID-19 Command Center, were made available for enterprise-wide use on the intranet and updated frequently as we gained experience with the management COVID-19-associated thrombotic states.

5.2 | Anticoagulation guidelines for acute treatment and prevention of thrombosis

In order to proactively address the issue of COVID-19 associated thrombosis, a multidisciplinary team of experts was quickly assembled. Two groups were created, a Cardiology and a Vascular Task Force, with representatives from each hospital within the health system. The task force members, consisting of Cardiologists, Hematologists, Intensivists, and Vascular Medicine Specialists, met virtually on a weekly basis and worked closely with our associate chief medical officer and antithrombotic clinical pharmacist to initially develop and then refine
anticoagulation guidelines for the treatment and prevention of COVID-19-associated arterial and venous thromboembolic disease. Working closely with our enterprise task force members, anticoagulation treatment and prevention algorithms were developed.

Our antithrombotic service team selected a group of preferred anticoagulants that minimized the need for nursing administration and laboratory monitoring. This included minimizing the use of unfractionated heparin (UFH), for both VTE treatment and prophylaxis, when possible. The use of low molecular weight heparin on a once daily dosing schedule was used as a preferred agent for both treatment and prophylaxis for patients who did not have moderate to severe renal dysfunction. Low molecular weight heparin and direct oral anticoagulants (DOACs) were chosen as preferred agents for suitable outpatients for acute VTE treatment and prophylaxis due to the limited need for laboratory monitoring; arrangements for outpatient laboratory monitoring were challenging to arrange.

Extended VTE prophylaxis guidelines were developed with risk stratification tools to identify eligible patients. Eligible patients received a prescription for a 6-week course of chemoprophylaxis, were scheduled for a two-day outreach call, and a one-month telemedicine appointment with our antithrombotic team for assessment and re-determination of duration of therapy. The use of extended VTE prophylaxis in the discharged medically ill COVID-19 patient population was labor intensive. These patients required thrombotic and bleeding risk assessment by the medical teams, comprehensive medication patient education which was provided virtually by our pharmacy staff, drug procurement, and scheduled follow-up transition of care services, as outlined below. The most laborious component to making arrangements for follow-up care was activation of each patient’s EHR chart, named My Chart®, which was necessary for follow-up telemedicine appointments. We encountered challenges with activating accounts for patients that did not have email accounts, had limited technology at home (computers, smart phones, tablets, or internet access), or were homeless. In these situations, an alternative process employing the use of scheduled telephone visits was utilized. The City of Philadelphia had arranged for homeless people to be housed in specific hotels. As such, homeless individuals were discharged to these hotels and could be reached by telephone for their follow-up calls.

Patients being treated for COVID-19-associated acute VTE disease were discharged on either low molecular weight heparin utilizing a once daily dosage regimen, or a DOAC with success. We attempted to discharge one patient with moderate renal dysfunction on warfarin but were unable to successfully coordinate outpatient lab/home care services during the height of the epidemic, therefore a renally-adjusted dosage regimen of a DOAC was chosen as an alternative with a successful clinical outcome. We found that the use of manufacturer’s initial free 30-day discount program cards for DOACs were useful for the uninsured patient population, with additional assistance provided by our transition of care coordinator to submit applications for respective manufacturer’s medication assistance programs to ensure an adequate supply of anticoagulation for their full treatment course.

Given that COVID-19 represents a unique challenge related to coagulopathy as patients often present with increased thrombotic risk while having high rates of bleeding, experts at our institution participated in a weekly international forum to share information on managing this difficult balance.

5.3 Adaptation and experience with COVID-19 associated transition of care services

As part of our initial collaboration efforts with the COVID-19 Command Center operations, our antithrombotic pharmacist and transition of care coordinator, who routinely utilize anticoagulation-related outreach programs, developed a telephone script specific to the patient discharged after a COVID-19 diagnosis. This telephone script was designed to be employed by enterprise-wide outreach personnel for follow-up telephone calls routinely scheduled for 2 days post-discharge for all COVID-19 positive patients. A more comprehensive process was developed for follow-up of patients discharged on extended VTE prophylaxis, or those on full anticoagulation, which involved a more focused antithrombotic assessment at the two-day post-discharge outreach call. Telemedicine appointments were scheduled in 1 week for patients with acute VTE disease and at 30 days for those on extended VTE prophylaxis. We utilized Centers for Medicare and Medicaid Services (CMS) guidelines for transition of care services for billing and reimbursement of telemedicine services, as per our usual standard of care practices. Ongoing medication reinforcement was provided via the telephone and formalized educational materials were sent to patients via their My Chart® account. For those without available technology, use of a telephone call visit was scheduled for care transition management.

5.4 Management of patients on chronic anticoagulation during the pandemic period

Our established patient population on chronic anticoagulation fared well, because the majority of these patients either had a point of care monitor or home phlebotomy services in place prior to the pandemic. Our strategy with the majority of patients on warfarin therapy who were managed via telemedicine or telephone visits had been to continue their usual testing methods and testing frequency, with ongoing educational reinforcement on the importance of consistent dietary vitamin K intake and avoidance of alcohol.

6 ROLE OF RESIDENT LEARNERS

The COVID-19 pandemic required the pharmacy residency program to modify the learning experiences for its residents. For the PGY1 Pharmacy Residency program, the Residency Program Director and Residency Program Coordinator referred to the frequently asked questions/responses from the American Society of Health-System
Pharmacists to develop a plan. The emergency plan was created to provide guidance for the preceptors and residents in an effort to minimize interruptions in the resident's learning experience and to be able to continue to achieve goals and objectives within a rotation. The plan outlined details and instructions to allow for one of three scenarios: (a) a hybrid learning experience with remote and on-site ability; (b) a remote learning experience; or (c) an onsite learning experience. Examples for each of the scenarios are below.

An example of a hybrid learning experience was for the Transitions of Care rotation. Typically, the resident's expectations involved educating patients in the hospital for the transitions of care programs such as heart failure, community-acquired pneumonia, chronic obstructive pulmonary disease, and educating outpatients in the family medicine clinic and refugee clinic. The learning experience was modified with two of the four weeks spent onsite with the Pharmacy Concierge service provided by the outpatient pharmacy. Medications are delivered to the bedside of patients waiting to be discharged from the hospital with medication education provided. The remainder of the rotation was remote where the resident and preceptor met virtually daily for topic discussions and check-ins. The resident also participated in providing telehealth calls to the outpatients for medication adherence.

For a remote learning experience, if the preceptor for the experience was remote for the duration of the rotation, the resident was also remote. The preceptor would ensure that all of the learning objectives could be achieved remotely. Two particular rotations where this worked well were an elective in the Bone Marrow Transplant unit and in the Cardiothoracic Surgery Intensive Care Unit. The preceptor and resident would round virtually with the team and set up meetings for topic discussions and further check-ins. Virtually rounding lent a unique opportunity to have effective side conversations with the resident, which allowed more coaching and facilitation without interrupting the team, which helped to boost the confidence of the resident. Additionally, residents were able to perform warfarin education to patients and obtain medication histories over the phone.

Finally, not all rotations were able to be remote or a hybrid learning experience. Usually, the preceptors for these rotations were onsite daily. For example, residents who had a rotation in the Emergency Department were onsite with their preceptor.

Pharmacy residents also continued with their longitudinal experiences in staffing and administrative duties on evenings and weekends. A weekly Friday afternoon meeting was held by the department management team with the residency class to hand off communication pertaining to COVID-19, particularly regarding medications used for treatment as outlined by hospital guidelines, including hydroxychloroquine and remdesivir.

7 | LESSONS LEARNED

In reflecting on the rapid and significant changes to the operations of the pharmacy practice model, we believe the changes were largely successful. First, to the best of our knowledge, no pharmacist became infected with COVID-19. This was one of the most important goals of the change, as it allowed our pharmacists to continue working in full capacity while protecting themselves and our patients. Second, despite the learning curve with virtual rounding, most pharmacists voiced appreciation for having the opportunity to work from home to remedy changes in childcare and local shutdowns. In the previously outlined strategies, other disciplines did not note issues with collaborative care and received help in a timely fashion from pharmacists.

A number of valuable lessons were learned during the pandemic. Being proactive, planning ahead, and clear communication were key components to the large-scale changes in the pharmacy practice model. In addition, close collaboration with other disciplines was essential. The success of the revised pharmacy practice model was a consequence of the buy-in from medical teams to participate in virtual rounding.

In planning for a future health crisis (including the second wave of the COVID-19 pandemic), our department can continue engaging with leaders across health-system on the necessity to streamline virtual rounding. In our anticipation of massive drug shortages, we purchased what in hindsight turned out to be an abundance of medications we did not need to treat this disease. As we face a potential second wave, we are in a much better position to focus our drug purchasing to specific medications and quantities based on what we know we used during March and April. We also developed a daily pharmacy leadership call among our 13 hospitals across the health system that has proved invaluable for tracking medication use and variations among our local communities. It has also provided a forum for coordination of the procurement, storage, and reporting requirements for the Emergency Use Authorization medications released to us over the course of the pandemic.

8 | CONCLUSION

As the COVID-19 pandemic has continued to evolve establishing “hot spots” in other areas of the country from the original locations in March and April, we have learned more about caring for these patients. This has required us to constantly update the approach the Department of Pharmacy has taken during this time and the guidance which is provided on pharmaceutical care of these patients. The COVID-19 pandemic has presented Departments of Pharmacy across the nation with challenges that have not been experienced by most. This has forced departments to take swift action and devise plans that would allow pharmacists to provide a high level of patient care while mitigating personal risk, and risk to others, from the pandemic. This brief report provides one example at an academic medical center where significant changes in the pharmacy practice model were implemented, but still allowed pharmacists to provide a high level of patient care. This was made possible by leveraging technology, and rapid and effective interdisciplinary collaboration between health care divisions within Thomas Jefferson University Hospital.
CONFLICT OF INTEREST
The authors declare no conflicts of interest.

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