COVID-19 preparedness: Clinical pharmacy services remote staffing in a quaternary, level I trauma and comprehensive stroke center

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Purpose. The rapid spread of the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes coronavirus disease 2019 (COVID-19), has strained the resources of healthcare systems around the world. In accordance with recommendations from the World Health Organization, Centers for Disease Control and Prevention, and US Department of Defense, Intermountain Medical Center (IMED) in Murray, UT, has developed a plan to provide remote clinical pharmacy services to protect the health of pharmacy caregivers while maintaining appropriate clinical pharmacy coverage to optimally care for patients.

Summary. The utilization of telemedicine technology permits clinical pharmacists to readily communicate with nurses, physicians, other caregivers, and patients. We have identified strategies to allow clinical pharmacists to continue to participate in daily rounds, provide consultations under collaborative practice agreements, verify medication orders, collect medication histories, provide antimicrobial stewardship, and deliver medication education to patients from off-site locations. The pharmacy department at IMED proactively tested telemedicine technologies, defined the roles of clinical pharmacists, and identified communication strategies prior to a rapid rise of COVID-19 in the state of Utah.

Conclusion. The proactive measures described can help ensure that pharmacy caregivers have appropriate remote access and are capable of confidently using the resources. These steps allow for optimal care of hospitalized patients and promote social distancing, which may have the added benefit of decreasing the spread of SARS-CoV-2 among patients and caregivers.

Keywords: clinical pharmacy, COVID-19, novel coronavirus, remote work, SARS-CoV-2, telepharmacy

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the cause of coronavirus disease 2019 (COVID-19), was first identified in Wuhan, China, in late 2019 and is rapidly spreading across the world, with over 1.9 million documented cases of COVID-19 and more than 117,000 deaths attributed to COVID-19 worldwide as of the time of writing.[1,2] The disease is highly transmissible, and the World Health Organization estimates that the incubation period is between 1 and 14 days.[2,3] Healthcare systems throughout the world, most notably in Italy,[4] Spain, and now in the United States, have been overwhelmed by the influx of patients with COVID-19.[1] Healthcare workers are at particularly high risk for contracting COVID-19 given their proximity to patients presenting with SARS-CoV-2 infection, an inability to immediately diagnose COVID-19, and even a lack of personal protective equipment.[3,5-7] Recently, over 150 healthcare workers in hospitals in Boston, MA, tested positive for SARS-CoV-2, and about 2,200 caregivers in Michigan's 2 largest health systems had COVID-19 symptoms or had tested positive for SARS-CoV-2, which may worsen the strain on the healthcare system due to decreased caregivers and increased patient volumes.[8,9] This pandemic highlights the importance of protecting healthcare workers while maintaining proper patient care.

Health systems throughout the world have implemented telehealth services to reach rural populations and expand coverage.[10,11] Medical providers use telehealth videoconferencing to visualize patients, diagnose, and prescribe therapies.[10,11] Pharmacists also use the same communication tools to relay drug information and counsel patients.[10,11] Due to the high transmissibility of SARS-CoV-2, there may be a need to move pharmacy services to remote locations.

The American Society of Health-System Pharmacists has published guidelines describing the role of a pharmacist in remote medication order processing.[12] To verify electronic orders,

patients' profiles must be accessible to a pharmacist within the electronic medical record (EMR), thereby enabling pharmacist review of a myriad of data for appropriateness.[12] A pharmacist may also review the patient's medication administration record for therapeutic duplication, drug interactions, and pharmacotherapeutic optimizations.[12] These tasks may be performed electronically from remote locations.[13] Although the guidelines were published to address the need for 24-hour pharmacy services in rural locations, they may be applicable in the current global pandemic to limit exposure and prevent disease transmission.[6]

Amid the COVID-19 pandemic, the Intermountain Medical Center (IMED) "Remote Pharmacy Services Plan" was created to limit exposure to SARS-CoV-2 and mitigate potential staffing shortages due to illness or quarantine. Our plan is designed to protect the public by decreasing the risk of SARS-CoV-2 exposure for our patients, clinical pharmacists, and other caregivers while maintaining high standards of pharmacy clinical services.

The IMED Remote Pharmacy Services Plan

The IMED Remote Pharmacy Services Plan includes remote clinical pharmacy services tactics to prepare for staffing challenges created by SARS-CoV-2. Based in Murray, UT, IMED is a quaternary referral medical center serving 4 surrounding states; it is the largest of Intermountain Healthcare's 24 hospitals. The medical center has 504 inpatient beds and 80 emergency department (ED) beds, with approximately 90,000 annual ED visits. IMED has a 157-member pharmacy staff (including 73 pharmacists and 7 pharmacy residents). Decentralized pharmacists have dedicated work assignments and collaborate with clinical teams to optimize patient care.

Remote pharmacy services. To minimize pharmacy service interruptions during the COVID-19 pandemic, IMED developed a plan for providing remote clinical pharmacist services. Prior to implementation, all IMED pharmacy laptop computers were equipped with a secure-access virtual private network (VPN) application to ensure compliance with Health Insurance Portability and Accountability Act (HIPAA)[14,15] requirements for protection of patient information. Critical care pharmacists also had Intermountain's proprietary Connect Care Pro TeleHealth Services audio-visual (AV) software downloaded to their laptop computers. These applications allow caregivers to remotely access video and audio equipment within every intensive care unit (ICU) room (n = 275 beds system-wide) and ED room throughout the enterprise. Connect Care Pro TeleHealth Services also enable remote clinical pharmacists to participate in code responses and provide recommendations to caregivers.[16]

Telehealth services. Connect Care Pro consists of hardware and software enabling hospitalized patients to receive care from remote specialists including physicians, advanced practice providers (APPs), pharmacists, respiratory therapists, and nurses.[16] The Connect Care Pro hardware includes a high-definition television, camera, and a two-way audio speaker. The installed technology allows caregivers to access a patient's room to visualize care and communicate to caregivers and patients. Accessible information includes medication administration and drug infusion rates on intravenous (IV) medication infusion pumps. This technology and an interconnected EMR permit pharmacists to remotely contribute to patient care throughout the enterprise.

Communication methods. A priority of the plan is to provide uninterrupted communication between pharmacists working remotely and on-site hospital caregivers. Pharmacists at IMED use the Vocera Badge (Vocera, San Jose, CA), a hands-free, voice-

controlled communication solution, to communicate with caregivers.[17] The Vocera Badge is a wearable communication device used at IMED to streamline communication between caregivers. It allows caregivers to call and connect with each other in real time simply by saying a name, role, or group. The device also lets caregivers leave a message and set reminders. A plan for forwarding of Vocera Badge calls to the responsible clinical pharmacist's personal cellular telephone was developed. The call can be initiated by a nurse using his or her personal Vocera Badge. The process to route calls and messages to the clinical pharmacists' cellular telephone requires an on-site pharmacist to log into the Vocera Badge under the remote pharmacist's name and forward all calls to "an outside number." Remote pharmacists communicate with nursing staff each morning to ensure nurses know how to contact their pharmacist. Remote pharmacists also use a health information–protected instant messaging platform to communicate directly with on-site caregivers.

To ensure critical care pharmacists continue to participate in code response situations despite staffing challenges, a plan for use of TeleHealth AV software (TeleHealth Services, Cary, NC) was developed. For instance, if the neurology ICU pharmacist, who typically responds to all inpatient stroke code calls, was working remotely, stroke code responsibilities could be achieved in 1 of 2 ways: (1) the pharmacist, working remotely, would use the TeleHealth AV software to connect into the patient's room to communicate with the team; or (2) stroke code responsibility would be reassigned to an onsite ICU pharmacist, who would physically respond in the patient's room.

Remote clinical pharmacists contact physicians and APPs for rounds, consults, and clinical recommendations. The strategy used to round with providers was tailored for each team. The internal medicine and cardiology pharmacists schedule a daily call or videoconferencing

session with physicians and APPs to discuss pharmacy recommendations. The critical care pharmacists join daily rounds using cellular telephones and, when the team rounds inside patient rooms, the TeleHealth AV software. Additionally, the pharmacists communicate with providers via telephone, text messaging, Vocera Badge, and instant messaging. These processes are continuously modified as needed to achieve the most productive communication possible for each team. For example, internal medicine pharmacists started by trialing calling in for bedside rounds. However, pharmacists had a difficult time hearing the conversations, so they switched to scheduled daily "table rounds" (ie, roundtable discussions) with the medical providers.

Types of pharmacy services provided remotely. Clinical pharmacy services that can be provided remotely have been identified (Table 1). As mentioned previously, pharmacists have maintained involvement in daily rounds. Medication history taking, patient counseling, and discharge education are currently performed by telephone. A list of all patient room telephone numbers was published to allow pharmacy staff to call in to patient hospital rooms. To communicate with non–English-speaking patients, the pharmacy staff used telephonic interpretation services. If pharmacy personnel are not able to contact a patient by calling in to the room, the pharmacist contacts the bedside nurse to facilitate the telephone interview. The pharmacy and nursing leaderships developed a plan to ensure room telephones are placed within reach of patients and telephone ringers are active. If these methods fail, the remote pharmacist contacts an on-site pharmacist for assistance.

Pharmacy services that are now provided remotely without a process change include pharmacy collaborative practice agreement consults for the dosing and monitoring of vancomycin, warfarin, and insulin; order verification; and antimicrobial stewardship. Pharmacists may perform renal dose adjustment and intravenous-to-oral medication conversion

per protocol. Documentation is performed remotely in the same manner as during on-site work. Remote pharmacists can acknowledge infectious diseases stewardship alerts within the VigiLanz clinical surveillance platform (VigiLanz Corporation, Minneapolis, MN), which aggregates data from multiple EMR sources to generate alerts for caregivers.

Plan for staffing adjustments. A contingency plan was developed for use in the event IMED pharmacists become ill or require quarantine. This plan describes strategies the pharmacy department will implement to consolidate personnel according to the number of healthy pharmacists. All pharmacists were asked to assess their competency in practice site and skill areas such as central pharmacy, IV room, internal medicine, cardiology, critical care, emergency department, transplantation, operating room (OR), neonatal intensive care unit (NICU), infusion center, and retail pharmacy. Each pharmacist provided a self-assessment of acumen in each area using the following scale: 1 = no training, 2 = partial competence, 3 = works independently, 4 = works independently and can train others. This information may be used when reallocating staffing assignments.

The contingency plan calls for staffing adjustments based on pharmacist availability. In the event 75% or more pharmacists are available to work on-site, virtual pharmacy huddles will be held daily at 7 AM, 1 PM, and 3 PM. During huddles, staff duties will be assessed and reassigned according to need. Potential examples include consolidating decentralized pharmacists to cover multiple floors and reassignment of personnel to order verification. Instant messaging will be used to communicate emergent needs throughout the day.

If 50% to 75% of pharmacists are available to work on-site, the previously described communication plans will be used. A weekend staffing model will be implemented (Table 2). Personnel not able to work on-site due to quarantine but still capable of working remotely will be

allowed to work from home, with assignments for remote pharmacy services based on need and number of available staff. The infusion center will be staffed by one pharmacist on-site, and the second check for high-risk, high-cost, or chemotherapeutics will be completed by an infusion pharmacist working remotely or by an on-site centralized pharmacist.

In the event 25% to 50% of pharmacists are available to work on-site, shift lengths will be changed from 8-hour shifts to 12-hour shifts (Table 3). Pharmacists will consolidate and work from the central pharmacy to ensure medication distribution. A critical care and ED pharmacist will remain decentralized to assist with emergent cases. Pharmacy residents' rotations and staffing assignments will be modified. Residents will be assigned to work based on their staffing experience, previous rotations, and pharmacy staffing needs. If additional personnel become available, pharmacists will move to decentralized locations starting with the ED, ICUs, and NICU. If less than 25% of pharmacy staff are available to work on-site, the same protocols will be implemented; however, staffing assignments will require further consolidation.

Challenges and continuous process improvement. IMED clinical pharmacists may successfully perform essential, daily patient care duties from a remote location; however, this is not without challenges. We determined that many routine pharmacy tasks that are straightforward when performed in person require additional coordination and communication when carried out remotely. Pharmacists must rely on the reports of providers instead of assessing a patient face to face, especially on the medicine floors. Although many of the ED and ICU rooms within Intermountain's 24 hospitals are equipped with TeleHealth AV, the rooms on medicine floors at IMED do not contain this technology. Consequently, telephones located in the rooms of patients on medicine floors are used to provide discharge medication education. At the time of publication, we had begun working on a solution involving use of Surface Pro tablet

computers (Microsoft, Redmond, WA). The tablets may be positioned in patient rooms, allowing two-way visual communication.

The use of personal cellular telephones to address nursing staff questions, participate in rounds, and answer provider inquiries is not optimal. Huddles, rounds, and participation in clinical meetings each occupy a telephone line, occasionally making it difficult to answer incoming nursing staff calls. We worked with our local informatics team to identify options for remote pharmacists to have access to a second telephone line. Our team identified a computer application software that allows for telephone calls to be routed to a pharmacist's laptop. The installation of the Avaya One-X Communicator application (Avaya, Santa Clara, CA) allows pharmacists to place and receive phone calls using a laptop's built-in speaker and microphone; this permits pharmacists to participate in rounds and address questions routed to a secondary telephone application without a risk of disconnection during rounds. Despite reports of general Internet slowing occurring because of a community working from home, our pharmacists have had no difficulty accessing the EMR, completing medication profile reviews, and performing clinical consultations.

On the first day the IMED heart transplant pharmacist provided remote services, a transplant patient had unexpectedly been readied for discharge. Logistically, this created a problem we had not adequately anticipated. Although the discharge medication reconciliation was completed successfully by the pharmacist remotely, a plan had not been established for a pharmacist to visualize accurate filling of the patient's pillbox. Ultimately, the heart transplant pharmacist was able to coordinate with an experienced on-site pharmacist to review the pillbox contents with the patient. We have since determined that at least one pharmacist with transplant experience must be available at the hospital.

Multiple clinical services have used WebEx conferencing software (Cisco WebEx, Milpitas, CA) during rounds. However, remote team members did not foresee that on-site team members would be practicing social distancing. Some providers were distant from the telephone speaker, making it difficult for the remote pharmacist to hear the full conversation. One potential solution is to add additional microphones in the conference rooms to capture the conversation of all team members.

When pharmacists are completing remote patient profile reviews, they must rely on caregiver charting, listening on rounds, calling nurses using the Vocera device, and technology-aided discussions with providers. On-site pharmacists can easily troubleshoot medication-related issues, whereas pharmacists working remotely have become more reliant on other members of the care team to assess things like infusion pump–related issues and aid in patient education.

To date, the largest challenge has been determining the optimal methods of communication with a diverse group of providers. Many pharmacists found it effortless to connect with providers and nurses with whom they have developed long-term collegial relationships. It was more challenging to contact teams of consulting providers with whom such relationships were not as well established, although we historically communicated with these groups using a telephone. We soon learned the importance of contacting provider teams early in the day to educate them on how to communicate with the remote pharmacists. Working remotely limits the ability of pharmacists to have informal conversations with nurses and providers throughout the day; therefore, the pharmacist's normal workflow requires even more attention to detail. It is imperative that a standard communication method that is reliable, efficient, and works well for the healthcare team be developed. Finally, it is advisable for pharmacists to practice and become familiar with the organization's conferencing software. Knowing how to log in to the system

remotely, use the laptop's Internet camera, and share one's computer screen with other providers is essential.

Discussion

To protect our patients and hospital caregivers from the rapid spread of SARS-CoV-2 and the sequelae of COVID-19, we developed a remote pharmacy staffing model with 2 initial aims: (1) minimize pharmacists' exposure to SARS-CoV-2 and (2) address potential staffing shortages caused by illness or quarantine. Our plan adheres to Centers for Disease Control and Prevention recommendations while still allowing for provision of high-quality patient care.[2] An important goal of the IMED Remote Pharmacy Services Plan is to implement a strategy with low impact to nursing staff and other caregivers while maintaining optimal patient care.

The success of this plan relies on effective communication. We have used multiple communication methods, including emails, virtual and in-person huddles, secure instant messaging, and Vocera Badge calls. Virtual huddles have become essential to identify gaps in coverage, required consolidation of staff members, and distribution of pharmacy personnel. Pharmacists working remotely check in with nursing managers and caregivers to proactively address questions and concerns.

The IMED Remote Pharmacy Services Plan provides for a hybrid model of remote and on-site pharmacy services. As we learn more about the potential asymptomatic spread of SARS-CoV-2, we are also developing a rotating schedule to keep work groups together on-site and then alternate through remote assignments. Due to the long incubation period of the virus,[2,3] rotating staff every 1 or 2 weeks may help reduce viral spread.

Conclusion

In response to the current COVID-19 pandemic, the IMED Remote Pharmacy Services Plan was created to prevent illness and to address potential staffing shortages. We believe having a contingency plan focused on reducing the spread of SARS-CoV-2 and potential solutions addressing situations in which pharmacy staff become ill or require quarantine will help IMED better prepare for uninterrupted clinical pharmacy services and continue to optimally care for our patients.

Disclosures

The authors have declared no potential conflicts of interest

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Key Points

- Clinical pharmacists, as part of the healthcare team, are at increased risk for contracting COVID-19.
- As an integral part of optimal inpatient care, it is imperative to mitigate the illness and prepare for quarantining and staffing shortages of pharmacists by developing appropriate staffing plans.
- A clinical pharmacist remote staffing plan that includes strategies for maintaining uninterrupted communication, reviewing patient information and providing recommendations and interventions, and enabling remote attendance of clinical rounds is discussed.

Table 1. Intermountain Medical Center's Assessment of Remote Provision of Decentralized Pharmacy Services

Pharmacy Service	Can Service Be Performed Remotely?	How Will Service Be Performed Remotely?
Daily patient rounding	Yes	• Video or phone conference during table or bedside rounds • Scheduled daily check-in with providers to discuss patient-specific pharmacy recommendations
Order verification	Yes	• No change to process; VPN will be used to ensure safety of HIPAA-protected information accessed remotely
Pharmacy CPA consults	Yes	• No change to process; VPN will be used to ensure safety of HIPAA-protected information accessed remotely
Patient education	Yes	• Phone call to patient's hospital room • If unable to reach the patient, call bedside nurse to ask for help in facilitation interaction with patient
Medication history taking	Yes	• Phone call to patient's hospital room • If unable to reach the patient, call bedside nurse to ask for help in facilitating interaction with patient • Call dispensing pharmacy to further verify medication fill history
Response to rapid-response and code calls	Partly	• Medication preparation cannot be performed remotely • Attending remotely via TeleHealth AV and providing recommendations and interventions • Onsite pharmacists assigned to cover remote pharmacist code responsibilities (eg, code blue and stroke code calls)
Antibiotic stewardship	Yes	• No change to process; VPN will be used to ensure safety of HIPAA-protected information accessed remotely; Vigilanz (among other software) will be used to provide stewardship and recommendations

Abbreviations: AV, audiovisual; CPA, collaborative practice agreement; HIPAA, Health Insurance Portability and Accountability Act; VPN, virtual private network.

Table 2. Typical Inpatient Pharmacist Staffing Model at Intermountain Medical Center[a]

	Pharmacists Staffing Schedule[b]			
	Monday Through Friday		Saturday and Sunday	
Staffing Area	**Day Shift**	**Evening Shift**	**Day Shift**	**Evening Shift**
Internal medicine				
Telemetry	1	2	1	1
Orthopedic surgery	1			
Endocrine	1			
Oncology	1		1	
Acute rehabilitation	1			
Neurology	1			
Women's center	1		1	
Neonatal ICU	1			
Critical care				
STICU medicine	1	1	1	1
STICU trauma	1			
Surgical trauma			1	
Surgical transplant	1	1		
NCCU	1		1	
Respiratory ICU	1			
Emergency department	1	1	1	1
Cardiology				
Cardiac ICU	1	2	1	1
CVU3	1			
CVU4	1		1	
Thoracic ICU	1			
Central pharmacy				
Central	2	Evening: 2	1	Evening: 2
IV room	1	Overnight: 2	1	Overnight: 2

Order verification	3	0	0	0

Abbreviations: CVU3, cardiovascular unit floor 3; CVU4, cardiovascular unit floor 4; ICU, intensive care unit; IMED, Intermountain Medical Center; IV, intravenous; NCCU, neurosciences critical care unit; STICU, shock trauma intensive care unit.

[a]Numbers denote number of pharmacists assigned to area(s).

[b]Typical hours of scheduled shifts: day shift, 7 AM to 2:30 PM; evening shift, 2:30 PM to 11 PM; overnight shift, 11 PM to 7 AM.

Table 3. Contingency for Reduced On-site Staffing Assignments at Intermountain Medical Center

Shift	Pharmacist	Pharmacy Technician or Intern
	25% to 50% of Pharmacy Staff Available On-site	
7 AM–7 PM	2 central/IV room 3 order verification[a] 3 consults/Vocera/codes 1 infusion (in central)	2 IV room 2 central 1 infusion 1 OR 3 delivery
7 PM–7 AM	2 central/IV room 2 order verification/Vocera/codes	2 Central (IV/robot) 1 delivery technician
	<25% of Pharmacy Staff Available On-site	
7 AM–7 PM	2 central/IV room 2 order verification[a] 2 Consults/Vocera/Codes 1 infusion (in central)	2 IV room 2 central 1 infusion 1 OR 3 delivery
7 PM–7 AM	2 central/IV room 1 order verification/Vocera/codes	2 central (IV/robot) 1 delivery

Abbreviations: ED, emergency department; ICU, intensive care unit; IV, Intravenous; NICU, neonatal intensive care unit; OR, operating room.

[a]NICU/ICU/OR/ED skill set preferred; may include remote pharmacist.