Critical Care Tele-pharmacy Services During COVID-19 Pandemic: a Qualitative Exploration of Healthcare Practitioners' Perceptions

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Abstract

Background

The scope of clinical pharmacy services has changed during the COVID-19 pandemic with the view to mitigating both exposure and spread of the virus. The performance of novel pandemic-driven services such as tele-pharmacy has remained unexplored, until now. To investigate the perceptions of healthcare providers of the impact of tele-pharmacy services provided in critical care units during COVID-19.

Methods

A qualitative study of semi-structured interviews conducted with healthcare practitioners who worked in COVID-19 intensive care units and remotely interacted with clinical pharmacists at the Weill Cornell-affiliated Hamad Medical Corporation, Doha Qatar. A random sampling technique was employed to recruit participants, with the resultant interview guide piloted before the commencement of the data collection process.

Results

From a total of 129 and 200 Physicians and nurses respectively. 20 interviews were conducted with physicians (n=15), and nurses (n=5). From these interactions, a number of major themes emerged including satisfactory understanding across clinical environment and personnel (physician and nurses) about remote clinical pharmacists' roles; additional robust feedback on the perception of the remote clinical pharmacy service; an understanding by "frontline" health personnel on the discernible differences between remote and in-person coverage of clinical pharmacists; a reflection by both physicians and nurses on the novel challenges involved in the implementing of such pandemic-driven service; and solutions to overcome these challenges.

Conclusion

In this novel qualitative study of pandemic-driven tele-pharmacy service, we found a positive perception amongst healthcare practitioners towards this service; with residual challenges that will need further evaluation by large sampled sized surveys or mixed methods research.

Background

Coronavirus disease 2019 (COVID-19) clinical syndrome is caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and it has been declared as a global pandemic by the World Health Organization (WHO) on March 2020 (1). Worldwide current morbidity and mortality statistics stand at 270 million cases 5.3 million deaths (2). Despite the most successful vaccination rollout perhaps in the whole of human history, morbidity and sometimes mortality challenges continue to emerge largely driven by the emergence of different COVID-19 variants; such as the recent concerns around the Omicron variant so declared as a "variant of concern" by WHO (3). In Qatar, to date, confirmed

positive COVID-19 cases have exceeded 240 thousand with more than 600 deaths (4). Moreover, it has been observed that there is 110% inflation in the intensive care unit (ICU) admissions which started on February 2021 (5). The paradigm pre-COVID-19 pandemic setting around the world and across different clinical environments has been direct physical interaction between healthcare practitioners [HCP] (physician, pharmacist, nurse, physiotherapist, ...) when challenged with any clinical problem. Since the emergence of COVID-19 infection, healthcare systems were challenged by the necessity to sustain both the quantity and quality of services provided to patients without undue exposure and facilitation of the spread of the virus both in communities and among HCP. This is extremely important, particularly with the exponentially high transmission rates of SARS-CoV-2 which imposed a heavy burden on health professionals and healthcare systems (6). Therefore, there was a need to initiate and utilize approaches to maintain the continuity of care such as telehealth strategies including telemedicine and tele-pharmacy (4). Several studies conducted in different countries have described the role of tele-pharmacy in ambulatory settings, however, data on its use in critical care settings in the context of COVID-19 pandemic is sparse; and where available would not be representative of the peculiar pandemic settings around the world (7–9). Previous studies solely explored the clinical pharmacists' general roles during the COVID-19 pandemic from the pharmacy standpoint (10).

To our knowledge, no published studies investigated the role of clinical pharmacists in ICUs from the viewpoint of other healthcare providers in multidisciplinary teams, particularly with the remote provision of clinical pharmacy services.

During the pandemic, the pharmacy department at Weill Cornell-affiliated Hamad Medical Corporation (HMC) in Qatar launched a tele-pharmacy service to allow clinical pharmacists to remotely communicate with physicians, nurses, and patients. The department identified strategies to allow clinical pharmacists to attend to their usual responsibilities without physically attending medical ward rounds which may involve conducting medication reconciliation, providing recommendations related to initiating/terminating/adjusting medications among others. Other clinical activities that would hitherto require a contribution to therapeutic decision and plans of care, responding to consultations and drug information questions, application of antimicrobial stewardship principles, verification of medication orders, as well as delivery of medication education.

This qualitative explorative study aims to investigate the perception of other HCP (physician and nurses) in regard to the role of critical care clinical pharmacists in optimizing therapeutic plans remotely, and to identify the perceived challenges of integrating clinical pharmacists into the multidisciplinary management of patient care during the COVID-19 pandemic. Additionally, it aims to identify strategies that can help to improve tele-pharmacy clinical services involvement in patients' care during pandemics.

Methods

Aim

Investigate the perceptions of the HCP toward the role and the impact of the remote clinical pharmacists in optimizing patients' therapeutic plans. Discuss the perceived challenges of integrating clinical pharmacists into the multidisciplinary management of patient care during the pandemic and explore suggested strategies to advance the clinical pharmacists' involvements in patient care from the perspective of the HCP.

Study design, setting and participants

This qualitative study employed semi-structured interviews between October 2020 to January 2021 at Weill Cornell-affiliated Hamad Medical Corporation (HMC), which is considered the primary tertiary governmental provider of healthcare in the State of Qatar. The participants were HCP (physicians and nurses) who worked in isolated ICU facilities earmarked for COVID-19 patients and who were in remote non-physical contact with clinical pharmacists in the process of optimizing patients' therapeutic care plans. Eligible participants were selected using random sampling technique and subsequently an invitation was sent through a unified electronic mail system for participation. Consequently, participants were interviewed through voice calls using Microsoft Teams 2.0.

Data collection

To guide interviewers, a tool was developed based on questions from previously published studies investigating the similar outcome. To ensure the face and content validity of the instrument, experts in qualitative research have reviewed the tool for the language, wording, relevance, and how well it measures our objectives. Then, two pilot interviews were conducted with volunteer participants to ensure the clarity and readability of the interview questions. The final version of the guide [see additional file 1] incorporated questions to elicit information on the following broad topics:

Current knowledge and perceptions regarding the role of tele-pharmacy in critical care units

Perceived challenges that impede healthcare practitioners from acquiring the full benefit of clinical pharmacy services when these services are provided remotely

Perceived strategies to address these barriers

Thirty minutes interviews through Microsoft Teams 2.0 were scheduled at mutually convenient times. Each interview was conducted by one investigator (AA, SA, or NI) and was audio-recorded. Study investigators had 'debriefing' sessions after each interview. The audio recordings were transcribed verbatim and inserted into a Microsoft Excel datasheet. Data collection continued until saturation of themes was reached, and no new points emerged.

Data analysis

Data analysis started after conducting and transcribing all interviews. Using thematic content analysis, recommended by Braun and Clarke for qualitative research, texts that are considered relevant to the research questions were coded independently by two investigators (NI, SS) (11). Codes were generated

manually by reading each interview alone and a continuous process of reflection and refinement was done to ensure the constant meaning of the codes. Agreements were made through consensus and discussions continued until a stable coding structure was created. Once all data coding was completed, codes were compared and sorted into relevant categories based on the key concepts of the study then themes were identified.

Results

From a sample pool of n=129 and n=200 physicians and nurses respectively, a total of 20 interviews were conducted with HCP which comprised 15 physicians and 5 nurses from October 2020 until January 2021. All participants worked directly with critically ill COVID-19 patients during the pandemic (Table 1). Theoretical saturation was reached by the 13th interview with the physicians and the 3rd interview with the nurses, but we enrolled two additional participants to confirm that no new data would emerge from subsequent interviews.

Table 1
Characteristics of study participants

Participants	Profession	Age	Sex	Year of graduation	Year of joining HMC	Worked with a CP before	Frequency of consulting a CP
P1	Specialist (Internal medicine)	35	F	2012	2019	Yes	Daily
P2	Senior consultant (Trauma ICU)	52	M	2008	2018	Yes	Daily
P3	Senior consultant (Anesthesia-cardiology)	55	F	1994	2007	Yes	More than 1x/wk. but less than 1x/day
P4	Specialist (ICU)	35	M	2011	2018	Yes	Daily
P5	Specialist (ICU-pulmonologist)	34	F	2010	2013	Yes	Daily
P6	Associate consultant (Endocrinologist)	49	M	1997	2010	Yes	More than 1x/wk. but less than 1x/day
P7	Associate consultant (Trauma ICU)	50	M	2001	2009	Yes	Daily
P8	Senior consultant (Surgical ICU)	51	M	1997	2004	Yes	Daily
P9	Senior consultant	48	M	2001	2004	Yes	More than 1x/wk. but less than 1x/day
P10	Consultant (ICU)	52	M	1997	2007	Yes	Less than once weekly
P11	Specialist (ICU)	36	M	2010	2014	Yes	Daily
P12	Consultant (ICU)	48	M	1998	2005	Yes	Daily
P13	Consultant (ICU)	50	M	1995	2015	Yes	Daily
P14	Specialist (ICU)	39	M	2007	2013	Yes	More than 1x\wk. but less than 1x/day
P15	Consultant (ICU)	47	M	1997	2011	Yes	Daily

Participants	Profession	Age	Sex	Year of graduation	Year of joining HMC	Worked with a CP before	Frequency of consulting a CP
P16	Nurse (ICU)	35	M	2007	2010	Yes	Less than once weekly
P17	Nurse (ICU)	30	M	2013	2015	Yes	Never
P18	Chief nurse (ICU)	40	M	2000	2017	Yes	Never
P19	Chief nurse (ICU)	48	M	1998	2018	Yes	Less than once weekly
P20	Nurse (ICU)	39	M	2005	2011	Yes	Never
HMC: Hamad Medical Corporation, CP: Clinical Pharmacists, ICU: Intensive Care Unit,, M: male, F: female, 1x/wk= one time per week, 1x/day= one time per day							

From these interviews, 30 codes were identified and consequently categorized into 5 major themes. These, together with the subthemes, are described in Table 2.

Table 2
Themes derived from the interviews

Major themes	Subthemes	Summary of findings
1. Healthcare professionals' current knowledge about the remote clinical pharmacists' role	<p>I. Knowledge about the CP role in all settings</p> <p>II. Knowledge about the role of the remote clinical pharmacists in COVID-19 ICUs</p>	Overall, healthcare professionals are aware of the role of the CPs in their original settings. They are also aware to a high level of the remote CP role during the pandemic
2. Perception of the healthcare professionals toward the remote clinical pharmacists	<p>I. Satisfaction of healthcare professionals with the remote CP responses</p> <p>II. Healthcare professionals' willingness to cooperate with the remote CP</p>	Healthcare professionals perceived that the remote CP responses to the drug-related inquiries were satisfactory. They also showed great willingness to cooperate with the remote CP to optimize patients' care
3. Differences between remote and in-person coverage of clinical pharmacists during the pandemic	<p>I. The impact of the remote CP coverage vs in-person attendance of CP</p> <p>II. Areas of consultations</p>	Healthcare professionals mentioned that the overall impact of the remote CP was enormous on both sides: direct patient care and quality improvement projects. They also reported that they usually ask for the remote CP consultations to confirm the patients' medications histories, to inquire about the use of newly approved medications, and to get updates about the protocols of antimicrobial and anticoagulation therapy for COVID-19 patients
4. Challenges to patients' care.	<p>I. High patients' number</p> <p>II. Delayed access to patients' clinical status</p> <p>III. Difficult communication</p> <p>IV. Limited patients' clinical assessments</p>	Healthcare professionals highlighted that the high patient load, the unavoidable delay in electronic documentation and the complicated communication process due to the COVID-19 precautions were the main challenges in the remote CP coverage

Major themes	Subthemes	Summary of findings
5. Solutions to overcome the challenges	I. Increasing remote CP number II. Expanding remote CP privileges III. Dedicating time for remote CP communication	Due to the high number of patients and the increased load on the remote CP, healthcare professionals suggested increasing the remote CP number in critical areas. They also highlighted the need for expanding the remote CP privileges to include ordering lab tests required for medication safety and efficacy monitoring. Lastly, due to the shortage of time during the pandemic, a daily dedicated time to communicate with the remote CP would help the team to generate a multidisciplinary care plan
CP: Clinical pharmacists, ICU: Intensive care unit		

Theme 1: Healthcare professionals' current knowledge about the remote clinical pharmacists

Participants' knowledge about clinical pharmacists' role in all settings

Although study participants were from different specialties, most of them showed an understanding of the role of clinical pharmacists in contributing to optimal patients care in different hospital settings.

"Clinical pharmacists are very important. I mean very important. I think their main role is to advise clinicians about different aspects of medications that we prescribe for the patients. For example, usually, patients admitted to the hospitals are receiving many medications (polypharmacy). So, the clinical pharmacist helps us to know the right drugs depending on patient's factors and drug pharmacokinetics and pharmacodynamics characteristics. In addition to checking the drug-drug interactions. So, I find pharmacists are extremely helpful in guiding us through the process of designing therapeutic plans" (Physician 9)

"Clinical pharmacists are very helpful in our original department. We used to call them to verify the patients' medications and to confirm if there is any drug-drug interactions between the medications that we want to administer together. Additionally, we used to contact them if we want to confirm the timing of drawing blood for drug level measurement." (Nurse 2)

Participants' knowledge about the role of the remote clinical pharmacists in COVID-19 ICUs

Participants were aware of the role of the remote clinical pharmacists during the pandemic.

"I am a cardiologist, I covered COVID-19 ICU for more than 6 weeks during the pandemic. I used to contact the clinical pharmacist daily. You know in the heart hospital, we are covering cardiac patients and post-surgical patients. So, our knowledge regarding other medications is limited. You know, COVID-19 is a

different experience since we face many patients with uncontrolled comorbidities and blood sugar. So, daily, we were contacting a clinical pharmacist, to help us with these medications” (Physician 3)

“Clinical pharmacists are helpful in answering questions related to the medication, for example identifying drug-drug interactions or the proper administration of any medication” (Nurse 2)

Theme 2: Perception of the healthcare professionals towards remote clinical pharmacists.

Satisfaction of healthcare professionals with the remote clinical pharmacists’ responses

Overall, the most apparent emergent codes were that most of the participants mentioned remote clinical pharmacists’ level of readiness to deal with the pandemic, which they adjudicated as satisfactory. The pharmacists were periodically updated with the latest COVID19 management guidelines and the most recent hospital protocols as they become live; consistent with prevailing “best practice” during the pandemic.

“In my experience, it was definitely satisfactory responses. You know sometimes we have different opinions, but we were always able to talk and come to the best decisions together” (Physician 6)

Healthcare professionals’ willingness to cooperate with the remote clinical pharmacists

Participants were willing to cooperate with the clinical pharmacists in decisions related to the patients’ therapeutic plans.

“Yes, I used to cooperate with the clinical pharmacists and I am open to any suggestion from their side. Again, decisions related to the medications are always optimized when we took them along with clinical pharmacists. The dosage, as I mentioned before, and the drug-drug interactions. For example, a very common phenomenon in COVID-19 patients was cytokine storm syndrome. So, to decide to start the patients on tocilizumab, clinical pharmacist should be involved in the discussion. This medication was not well studied at that time, so the clinical pharmacist opinion was very crucial” (Physician 1)

Theme 3: The main differences between the remote and in-person coverage of clinical pharmacists during the pandemic

The impact of the remote clinical pharmacists’ coverage vs in-person attendance of the clinical pharmacists.

There was an agreement between the participants regarding the high impact of remote clinical pharmacists during the pandemic in the care provided to the patients, especially that most of the physicians were from specialties other than infectious diseases and critical care which substantiated the role of the clinical pharmacist in checking the appropriateness of the medications.

“The clinical pharmacists used to call the team after the round, their role basically is reviewing all the patient’s medication appropriateness, doses, frequencies, and drug-drug interactions. Many new medications were added newly to the COVID-19 protocol during the pandemic. The efficacy and the safety of these medications were still not clear and there were new studies coming out daily. Clinical pharmacists used to provide us with the updated information.” (Physician 5)

Although most of the participants strongly agreed with the remote coverage of the CPs during the pandemic, others preferred in-person coverage.

“Of course there were noticeable differences between the physical coverage and the remote coverage. Actually, Cerner helped a lot in keeping the health care team members on the same page but still the physical attendance of the round used to give a higher impact on the patients’ care. Indeed, the clinical pharmacists are not doing physical examination to the patients. But, they have a great clinical sense.” (Physician 6)

“The remote coverage of the clinical pharmacists did not affect the patients’ care at all. This is because there was a robust communication through mobile or landlines between the physicians and the clinical pharmacists. You know, the Cerner has the ability to allow more than two people to review the same patients’ files at the same time. So, we were contacting them (clinical pharmacists) when we have any inquiries or any problem regarding the medications. The senior consultant and I used to conduct a daily session with the clinical pharmacists to review all patients’ medications.” (Physician 1)

Areas of consultations

There are many areas where the participants needed the clinical pharmacists’ clinical judgment and recommendations. The areas that were mentioned during the interviews were: initiation of interleukin-6 receptor inhibitor and COVID-19 antiviral treatments, drug interactions, dose adjustments, side effects, drug combination, and alternative medications.

“The most common question during pandemic was related to the anti COVID-19 therapies and the best anti-coagulations choice and dose.” (Physician 9)

“Of course the questions directed towards the medications and intravenous infusions. You know especially in the critical area, the patients’ conditions can change dramatically from moment to moment; whether laboratory or clinically wise. These rapid changes in the patients’ conditions need clinical pharmacist who is aware of the patients’ medications and who can maintain frequent updates in the medications. For-examples: the best management for the high blood sugar level, the electrolytes disturbances, the new cultures, and the antibiotics choices... etc. So, we ask the clinical pharmacists about their recommendations and they ask us as well, it is a two-way discussion. They suggest to us and we suggest to them certain changes in the medications or intravenous infusions according to the patients’ needs.” (Physician 5)

Theme 4: Healthcare professionals' perceived challenges to collaborate with the remote clinical pharmacists during the pandemic

High patients' number

During the pandemic, the admission rate to the ICU was high which increased the load on the remote clinical pharmacists who were covering the ICUs.

"Due to the high number of patients in the ICU, I think the number of the clinical pharmacists who were covering the critical care area was not enough. I mean imagine that we expect the clinical pharmacists to check a huge number of patients' profiles and their medications including doses, indications, and drug-drug interactions. This makes us expect a higher rate of medication errors." (Physician 4)

Delayed access to latest patient's clinical condition

The remote coverage allowed clinical pharmacists to electronically review the patients' cases through Cerner which is the online patient information management system. Documentation of some critical lab values and physical examination could be delayed until after the rounds and on many occasions physicians and nurses will be engaged in the bed-side duties which will postpone the documentation further and since the clinical pharmacist relies mainly on Cerner to receive the updated, there could be a delay in the workflow.

"Lab results timing used to be different actually. For example, we used to order investigation for monitoring drug levels. Sometimes we know the level from the lab specialist (especially if it is critical) while it is still not appearing in the electronic patients' profile. So, when I contact the clinical pharmacists, I need to inform them about the level and wait for them to respond to me with the correct action. So, like these practical difficulties were there." (Physician 1)

Difficult communication

There were different modalities of communication between the physicians and the remote clinical pharmacists during the round. This depended on the consultant's preferences. While some consultants used to contact the clinical pharmacist after finishing the round and discussing the patients' cases one by one, others used to contact the clinical pharmacists to ask them if they have any intervention in regards to patients on the list and discuss specific questions related to the medications.

One of the perceived challenges mentioned during the interviews was the telephone communication with the clinical pharmacist post-round.

"Because, in my original department, I used to go for the round with a clinical pharmacist beside me. To call a clinical pharmacist on the telephone was time challenging. If I was having a clinical pharmacist in the round with me, I would have been asking more questions than we could ask through the telephone" (Physician 5)

“Because of the COVID-19 risk, we were not allowed to use our telephones (mobile phones). So, we used to go out of the unit with a list of questions prepared in our minds to speak to the clinical pharmacist over the phone then to go in again. This was time-consuming. Also, because I could only have one or two conversations due to my limited time. I had to ask the most important questions while I skip the other questions that I would ask if a clinical pharmacist presents physically with me” (Physician 2)

All the nurses mentioned that contacting remote clinical pharmacists was very challenging for them.

“They were very busy days, we were fully occupied with severe patients’ cases. It was a real challenge to have time for calls. So, if I had any question, I used to ask the physician who maybe ask the clinical pharmacists instead of me” (Nurse 2)

Limited patients’ clinical assessment

Clinical pharmacists have their own clinical judgment, thus their availability during the morning visits to patients’ rooms have an impact on their interventions and recommendations.

“Indeed, the clinical pharmacists are not doing physical examinations to the patients. But, they have a great clinical sense. Seeing the patient in the round could highly change their decisions regarding the medications” (Physician 6)

“The electronic medical profile is not enough to send a full clinical image about the patients’ cases. So, sometimes the clinical pharmacists would have recommendations which are not suitable due to their limited clinical information about the patient status” (Physician 6)

Theme 5: Possible solutions expressed by healthcare professionals towards addressing the challenges related to the provision of full collaboration with the remote clinical pharmacists during the pandemic

Increasing remote clinical pharmacists’ number

Due to the drastic increase in the patient load during the pandemic, each remote clinical pharmacists used to have a high number of patients to cover. Participants suggested increasing the number of remote clinical pharmacists covering ICUs.

“The number of the clinical pharmacists who were covering the critical care area is low because the bulk of patients was very high. For improving the management of patient cases I highly recommend increasing the number of clinical pharmacists. I mean looking at drugs for many patients and their interactions and all other details is not an easy job. So, we expect a miss or a higher medication error rate” (Physician 12)

Expanding remote clinical pharmacists’ privileges

Participants mentioned that the high qualifications of clinical pharmacists qualify them to expanded privileges such as allowing them to request lab orders.

“One suggestion is to allow clinical pharmacists to put lab orders. This would help us and them to provide better care. For example, the trough level of vancomycin, and anti-Xa levels for patients on enoxaparin. The clinical pharmacists are the best ones to determine the correct timing of these lab tests.” (Physician 2)

Dedicating time for remote clinical pharmacists’ communication

During the pandemic, the patient’s number was huge in the ICU, and the time was limited. To conquer this issue, some participants suggested dedicating time for communication with clinical pharmacists.

“So, what we were doing, we used to finish the round which would take maybe 3 hours. Then we decide changes in medications from the physicians’ point of view. Then, we used to set with the clinical pharmacists through the mobile phone or landline phone. That specific clinical pharmacists that we were contacting used to review all patients’ profiles before our call. This was a great effort from him actually. After that, we start discussing the patients one by one and discuss the clinical pharmacist’s recommendations. This session used to take 30 minutes to 1-hour maximum, but it was really helpful and organize our work.” (Physician 7)

Discussion

This study highlighted the perception of other healthcare professionals towards tele-pharmacy service in ICU settings during COVID-19 pandemic. Additionally, it focused on the challenges and their solutions from the perspective of the healthcare professionals who were in direct contact with the remote clinical pharmacists.

Five major themes emerged from this study, including 1) Healthcare professionals’ current knowledge about the remote clinical pharmacists’ role 2) Perceptions of the healthcare professionals toward the remote clinical pharmacists 3) Differences between remote and in-person coverage of clinical pharmacists during the pandemic 4) Challenges to patients’ care, 5) Solutions to overcome the challenges.

Interestingly, the COVID-19 pandemic was an emergency in which many physicians from different specialties (e.g. internal medicine, cardiology, endocrinology) were reallocated to help critical care physicians in managing COVID-19 patients similar to many other countries (10). These non-ICU physicians had limited experience in managing the drug therapy of critically ill patients. In theme one, the participants highlighted the huge role of the remote clinical pharmacists in helping physicians from other specialties in managing critically ill patients.

The perceptions of other healthcare professionals towards tele-pharmacy service in our study is similar to the pharmacists’ perceptions reported from previous literature. In our study, participants mentioned that the role of the remote clinical pharmacists as vital, particularly in conducting medication reconciliation,

identifying drug-drug interactions, and monitoring medications' adverse effects. A recently reported cross-sectional study examined pharmacists' attitudes towards clinical benefits regarding the use of tele-pharmacy service during the COVID-19 pandemic in Jordan. This study showed that the majority of the participants expressed favorable attitudes towards tele-pharmacy to accurately capture and report COVID-19 signs and symptoms and they agreed that patients were able to receive immediate medical feedback while using tele-pharmacy services. Also, they emphasized the remote pharmacists' role in the monitoring of physiological parameters when entered by patients using tele-pharmacy technology (12).

Our study expanded the knowledge about the areas of tele-pharmacy interventions in ICU settings beyond what was shown from previous reports. In our study for example, participants mentioned different areas of consultations such as initiation of interleukin-6 receptor inhibitor, COVID-19 antiviral treatments, drug interactions, glycemic control, adverse effects, and alternative medications. A retrospective cohort study of adult ICU patients at Atrium Health showed that the most common intervention type done by tele critical care pharmacists was glycemic control (36%) (13).

According to the most updated analysis of COVID-19 in Gulf Cooperation Council (GCC) countries, Qatar had the highest recovery rate among the GCC countries with a percentage of 96.99%. Although, it has the maximum number of affected people when calculated per million among all the Gulf cooperation council countries. Nevertheless, it was reported that Qatar has the lowest death rate of 0.15% (14). Remote clinical pharmacists service was part of the changes implemented in Qatar's health care system to cope with the pandemic and may have accounted for this favorable mortality statistics. In our study, participants mentioned that due to the nature of the COVID-19 patients who required intensive care services and were at high risk of polypharmacy and multiple comorbidities, tele-pharmacy service was a great way to optimize the care provided to them. Additionally, in the second theme of our study, participants were satisfied with the CPs' responses in regard to their drug-related questions. Participants also showed a great willingness to cooperate with the CPs in order to optimize their patients' care.

In this study, the nurse's interviews have reached the saturation point very early. This is due to the lack of contact between the clinical pharmacists and the nurses during the pandemic. The nurses revealed that their contact was either with the inpatient pharmacy to solve medication supply issues or with the physicians to take any extra medication-related information needed. This is considered to be the main tele-pharmacy service limitation as it affected the direct contact between the nurses and the clinical pharmacists.

The principle strengths of our study lie in its novelty at exploring ICU personnel perceptions in regard to both the role as well as the delivery of the clinical pharmacists' responsibilities by tele-pharmacy during COVID-19 pandemic. Limitations of this study are mostly related to its qualitative design since the findings may be confounded by each individual's interpretation of experiences and perceptions. This could have been influenced by the investigators' personal biases (15). Additionally, it was difficult to invite the participants to check the generated themes. This notwithstanding, the adequacy of our sample size in

addition to full thematic saturation meant that these limitations are unlikely to significantly impact the outcome of our report.

Further studies are needed to determine the impact of the tele-pharmacy service in ICU settings and hospital length of stay, morbidity, and mortality. Additionally, a quantitative perspective is perhaps long overdue to compare the interventions and drug-related problems reported by the remote clinical pharmacists' vis-a-vis in-person clinical pharmacists' coverage.

Conclusion

In this novel qualitative study of pandemic-driven tele-pharmacy service, we found a positive perception amongst healthcare practitioners towards this service; with residual challenges that will need further evaluation by large sampled sized surveys or mixed methods research.

Declarations

I confirmed that all methods were carried out in accordance with relevant guidelines and regulations.

I confirm that we electronically shared the informed consent form with the Health Care Providers who agreed to participate in the research before the interview, with a statement that the agreement to participate in the interview would be considered as an implied provision of consent.

Ethical approval and consent to participate

The study protocol was approved by the institutional review board at the Medical Research Center, Hamad Medical Corporation (MRC - 01 – 21 – 746).

Consent for publication

Not applicable

Availability of data and material

Additional supplementary material is available from corresponding author on reasonable request. Data could not be available publicly. It can be shared with the journal editor and reviewers only upon request as it do contain identifiable information from the participants. Thus, some restrictions will apply. The data could be requested from the principle investigator Dr. Nour Isleem.

Competing interest

The study authors have no conflicts of interest to declare

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Authors' contribution

Noor Isleem: study concept development, liaison of regulatory authorities and approval, study design, study execution including participants interviews, data collection and curation, data analysis, initial and final manuscript drafts. All other authors contributed equally to the manuscript including data analysis and writing of the initial and final manuscript drafts.

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