Journal of Multidisciplinary Healthcare

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ORIGINAL RESEARCH

Virtual Handover of Patients in the Pediatric Intensive Care Unit During the Covid-19 Crisis

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Objective: A key measure to mitigate coronavirus disease 2019 (COVID-19) has been social distancing. Incorporating video-conferencing applications in the patient handover process between healthcare workers can enhance social distancing while maintaining handover elements. This study describes pediatric intensive care unit (PICU) physicians' experience using an online video-conferencing application for handover during the COVID-19 pandemic.

Design: Qualitative content analysis.

Setting: PICU at a university hospital in Riyadh, Saudi Arabia.

Subjects: PICU Physicians.

Interventions: Due to the pandemic, the hospital's PICU used Zoom® as a remote conferencing application instead of a face-to-face handover. Following institutional review board approval, data were collected over two weeks (1 Jul 2020 to 14 Jul 2020).

Measurements: An online survey was conducted using open-ended questions to capture demographic data and the perceived efficacy of remote handovers. Thematic framework analysis process included open coding, creating categories, and abstraction.

Main Results: All 37 PICU physicians who participated in the handover completed the survey. The participants comprised six attendings, nine specialists, and 22 residents. While 20 (54.1%) physicians reported attending 1–5 Zoom handovers by the time of the study, some (n. 6, 16.2%) had more than ten virtual handovers. They had variable previous teleconferencing experiences. Most physicians (78.4%) were comfortable conducting a remote handover. Most found that Situation–Background–Assessment–Recommendation handover elements were properly achieved through this remote handover process. The perceived advantages of online handover included fewer interruptions, time efficiency, and facilitation of social distancing. The perceived disadvantages were the paucity of nonverbal communication and teaching during virtual meetings.

Conclusion: Video-conferencing applications for online handovers could supplement traditional face-to-face intensive care unit patient handover during outbreaks of infectious diseases. The use of video streaming and more emphasis on teaching should be encouraged to optimize the users' experience.

Keywords: COVID-19, PICU, physicians, physical distancing, zoom for remote handover, tele-ICU

Introduction

Since the coronavirus disease 2019 (COVID-19) pandemic was declared in March 2020,[1] healthcare systems worldwide faced an unprecedented burden of optimizing care delivery to treat massive numbers of patients with COVID-19 while protecting healthcare workers (HCWs) from contracting the disease. As

Received: 11 March 2021
Accepted: 28 May 2021
Published: 25 June 2021

part of the preparation for the COVID-19 pandemic, lessons from similar outbreaks have helped establish known preventive measures. This is done by multiple interventions, including social distancing measures that were an integral part of the pandemic controlm[2,3] As part of the preparation for the COVID-19 pandemic, lessons from similar outbreaks have helped establish known preventive measures. As part of hospital preparedness for the large influx of infected patients, healthcare facilities were challenged with the limited number of airborne infection isolation rooms and intensive care unit (ICU) beds.[4]

During the evolving pandemic, various strategies should be implemented in the healthcare system, and at the local hospital setting[4–7] Additional efforts had also focused on maintaining the supply of personal protective equipment (PPE).

One fundamental hardship of physical distancing is conducting routine clinical care, including morning and closing rounds, or multidisciplinary rounds. Virtual rounds enable clinicians, including residents and attendings, to work together and plan daily care without crowding into patient rooms. This is the most important cultural hurdle that one may face, given the myriad clinical interactions occurring within teams in the hospital; thus, such distancing can be challenging.[8] However, technology is being used for multiple health utilities, including adolescent health utilizing artificial intelligence, machine learning, and virtual reality.[9] The efficacy of virtual interaction in a systematic review is mixed when it comes to emotional distress, health behaviors, and outcome.[10]

However, another meta-analysis focusing on sickle cell disease showed improvements in multiple outcomes, including self-management. However, the evidence from the included studies was modest.[11] The use of mobile phones for health monitoring was found to be helpful but with a limited sample size. This is also true for individuals with chronic conditions and preventive behavior.[12,13] The use of such technology may need to be coupled with behavior change theories, and most studies were of small size and included elements of bias.[14,15] In a meta-analysis of 11 studies, telemedicine use for pediatric care was as good or better than in-person care.[16] Effective patient handovers are critical for patient care and safety. This is even more crucial with the restriction of junior doctors' working hours, resulting in more patient handovers and, consequently, greater communication disintegration. The diversity of handover practices with their variable quality and structure can translate to medical errors, treatment delays, and additional tests, resulting in more extended hospitalizations and low provider and patient satisfaction.[17]

Multidisciplinary rounds typically occur either at the bedside or can be conducted in a conference room, promoting to perform them virtually whenever possible during an infectious disease outbreak through either conference calls or video chats is a beneficial idea.[8] At the same time, the handover process in our pediatric intensive care unit (PICU) between physicians involved all previous on-call physicians and all PICU on-service physicians, used to be conducted pre-pandemic with an average of 10–12 doctors gathering in the PICU nurses' station to endorse all PICU patients in the early morning. With the COVID-19 crisis and social distancing implementation, a remote handover process was introduced in our hospital on 14 May 2020, where all physicians are in various physical locations in the hospital (Figure S1).

This study evaluates the feasibility and describes the experience of complete video-conferencing for handover between PICU physicians in a tertiary care academic hospital. We hypothesized that virtual handover would be feasible in the PICU setting and that it will have both advantages and disadvantages to explore. We also looked at the overall number of PICU HCWs infected with COVID-19 in-hospital during that period, whether it is less in HCWs involved in virtual handover.

Methods

Study Design

This study is a qualitative deductive thematic content analysis of the narrative responses from HCWs in the PICU.

Setting

The physician staffing of the PICU at King Saud University Medical City (KSUMC) consists of six consultants, eight registrars, two PICU fellows, and 4–6 rotating residents from the pediatric department per month. All these physicians, along with nurses, one pharmacist, one clinical dietician, and respiratory therapists, work to serve 15 ventilated PICU beds available in the unit. With the COVID-19 crisis, the remote handover process was introduced in our PICU setting on May 2020, where physicians in various physical locations join the Zoom meeting at the beginning of the day to discuss the patients' conditions overnight (Figure S1).

All COVID-19 PCR confirmed HCWs within the PICU were reported by the Infection Prevention and Control department and based on their contact tracing were categorized into nosocomial or community cases.

Sampling and Recruitment

After obtaining institutional review board approval, we invited PICU physicians of KSUMC, who have been performing remote handovers using Zoom® since 15 May 2020, to describe their experience through a qualitative, pre-structured survey.

All 42 PICU physicians, including residents who had completed their PICU rotations in the last two months, were invited via email to participate in this study. Data was collected via email from 1 Jul to 31 2020.

Data Collection

Data were collected online through the SurveyMonkey® platform.[18] Open-ended questions were used, and probing was encouraged using questions such as "Why?," "Can you give an example?" and "Can you provide details to your answer?."

The survey started with questions on demographic information (eg, position, specialty, gender, and age). Then, general questions on identifying obstacles and facilitators of the online handover of care were introduced using probing. Additionally, satisfaction with the Situation–Background–Assessment–Recommendation (SBAR) communication framework was assessed by encouraging the respondents to elaborate and give examples that help understand each element's identified level of satisfaction. The SBAR tool is advocated as one of the requirements of the national hospital accreditation in Saudi Arabia,[19] and positive feedback of HCWs about SBAR was reported in the literature, with improvements in the communication and interdisciplinary team dynamics.[20] This is particularly vital in patient's handover, with better communication and completeness of transferred information in less time needed for the patient hand.[20]

Data Analysis

Thematic framework analysis was used to analyze data—the first step in the analysis involved reading and familiarizing the participants' range of responses. Categories were established, and two authors (NA and MT) developed codes independently. NA, an expert in qualitative methodology working in family and community medicine, introduced an etic perspective of the topic as an outsider of the study culture to reduce subjectivity in interpreting participants' responses. In contrast, MT, a PICU consultant, introduced an emic perspective as he has a great familiarity with the participants' experiences and views.

The developed codes by both authors were compared and found to be similar. The codes were discussed before a consensus on the coding frame was established. All themes were a priori themes; however, the range of responses under each subtheme was derived from the data.

Qualitative data management was conducted using NVivo 10, which was used to manage the data by categorizing quotes by themes and then quotes to different ranges of responses under each theme.

Data entry was performed electronically. Content analysis was used to analyze the participants' responses. The results were used as a part of the quality improvement project and shared with the Pediatric Department Quality Committee.

Results

Thirty-seven physicians (88%) responded to the open-ended questions using Zoom® for the handover of care between physicians in the PICU (Tables 1 and S1). The participants comprised six consultants, nine specialists, and 22 residents. Most (86.5%) had previous experience with the implemented Zoom® platform (Table 2), and approximately two-thirds also had previous teleconferencing experience in webinars or online learning activities. Furthermore, 78.4% of the participants (n = 29) reported that they were comfortable conducting such handover through Zoom or other similar applications (Figure 1).

The analysis of the responses revealed two main themes: online and face-to-face handover and the influence of online handover on quality of care.

Online and Face-to-Face Handover

Usability

In terms of fitness to use, the participants' views on the advantages and disadvantages of Zoom handover over the classic face-to-face handover varied. Twenty-nine participants found that online handover is better than face-to-face handover due to time and flexibility, which were also seen by the others (n= 12) as factors hindering proper communication among team members as problems with the internet connection and the audio could be affected (Table 3).

Furthermore, 3 participants acknowledged some features of Zoom that may encourage the team to participate easily in the handover process such as, sharing information and images of the patients.

Table 1 The Participants' Demographics

Category	n. (%)
Physicians Group:	
Consultant	6 (16.2)
Specialist/Fellow	10 (27.0)
Resident	21 (56.8)
Gender:	
Male	24 (64.9)
Female	13 (35.1)
Age Groups:	
26–30	15 (40.5)
31–35	9 (24.4)
36–40	3 (8.1)
41–45	6 (16.2)
46–50	3 (8.1)
51–55	1 (2.7)
Number of previous remote handovers sessions per participant:	
1–5 sessions	20 (54.1)
6–10	11 (29.7)
More than 10	6 (16.2)

Table 2 The Participants' Previous Teleconferencing Experience (N = 37)

Participants' Previous Teleconferencing Experience	n (%)
Zoom	32 (86.5%)
Online learning	24 (64.9%)
Webinars	23 (62.2%)
Work-related online meetings	11 (29.7%)
FaceTime	8 (21.6%)
Telephone-conferencing	6 (16.2%)
Others *	2 (5.4%)

Note: *Others: Google Meet, Skype, Facebook Messenger.

Interaction and Audiovisual

Ten participants, including 2 of those who preferred online over the face-to-face handover, believed that issues including "less interaction" and "less teaching" are encountered using online methods for reasons explained in Table 3.

Describing face-to-face handover was preferred as it assists in detecting non-verbal communication. However, the participants confirmed that cameras are not used during the handover. Participant 4, a resident, expressed the discomfort in using Zoom handover and related visualizing the speaker with understanding them (Table 3). "In addition to 7 more, the latter participant had suggested using cameras to increase the reliability of Zoom handover. Participant 4 noted that "Video calls between teams would be more comfortable." However, on their practice of sharing images as needed during Zoom handover, Participant 7 felt that visualizing the speaker might not be as important.

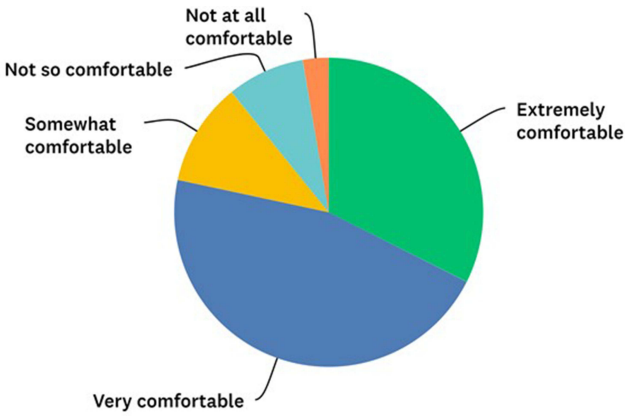

Figure 1 The participants' comfort level on conducting a remote endorsement (via Zoom or any other similar platforms).

Teaching Opportunities During Zoom® Handover

Participants (n= 19) were concerned about teaching, and they commented on that as part of the attributes of working at the PICU in a university hospital. One participant assumed that teaching was affected due to the negatively affected interaction via Zoom, as shown in Table 3. However, few participants (n= 2) observed no difference in using both manners.

Influence of Online Handover on Quality of Care

Responses revealed the participants' views on the effect of online handover on the quality of patient care and handovers.

Quality of Patient Care

Although some participants (n = 12) believed that the quality of work and patient care was not affected by online handover compared with the face-to-face handover, others perceived some positive (n = 15) or negative (n = 9) effects.

The quality of the work environment and patient care was maintained using Zoom handover. In Table 3, Participants 20

Table 3 Supporting Quotes

Theme 1. Online and Face-to-Face Handover		
Subtheme	Reasons for preferring Zoom handover	Reasons for preferring traditional face-to-face handover
Usability	"Zoom handover is less time-consuming due to fewer interruptions" P29 "Even if you are late for some reason, you can join the meeting at any place, focusing and writing your own notes." P22 "Zoom allows Sharing information of the patient to all interested (physicians) even not on-call." P12	"Time is shorter with face-to-face handover compared with remote handover" P 25 "Sometimes, due to connection errors, it (online handover) takes more time … face-to-face is usually quicker because there is no disruption of connection and difficulty hearing." P3
Interaction and audiovisual	"Tele meeting by zoom is a good substitute for a face-to-face meeting. I can share data as X-ray reports, and many subspecialties can attend and share their experience." *P7*	"You can see nonverbal communication like facial expression, hand gesture, eye-to-eye contact whereas, with Zoom, you cannot if the cameras are off." P5 "It wasn't comfortable as the classical way, in terms of sharing the information without seeing that the other team understood or listened to what you said." *P4*
Teaching opportunities during Zoom handover		"Teaching of residents is minimal during Zoom handover." P18 "interaction is less teaching also is less with the online handover" P18
Theme 2. Influence of online handover on quality of care		
Subtheme	Zoom handover does not affect the quality of care	Zoom handover affects the quality of care
Quality of patient care	"Remote handover has achieved the main goal of social distancing. Optimum patient care is being achieved with a smaller number of healthcare workers, attending consultant can attend the handover; so earlier decisions could be offered." P20 "I believe it (Zoom handover) will definitely improve patient care. Since I will get the information I need without having to worry about running late and missing some information/ updates about the patient." P32 "One advantage of remote handover is the avoidance of interruptions from family members or other teams which could happen in face-to-face handover." P28 "Decreasing the stress among HCWs during COVID-19 crisis and decreasing the possible contact with other asymptomatic SARS-COV-2 carriers. So, we have a more sustainable healthcare workforce to take care of more PICU patients." " … I don't think it does (affect patient care) because the PICU seniors always revise their patients thoroughly." P3	"Less number of Zoom attendees will have a smaller number of doctors who will critique or ask questions during the handover, less chance for the exchange of views and opinions." P5 "Most of the physicians will look all the time to a computer for handover and patient follow-up without assessing patients clinically." P15 "Sometimes, there are active patients and the time is not enough; we once had a patient who was a case of pulmonary embolism, she was very active, 85% of the time was spent talking about her condition, and we went over the other patients very quickly because of Zoom limited connectivity issues." P3
Quality of online communication	Reasons for holding a positive view over the quality of online communication	Reasons for holding a negative view over the quality of online communication
Situation	"We simply can describe the situation to all registrars and residents and also to consultants in their homes." P8 "It's (the situation element) fully achieved because it's the way we used to do it, either face-to-face or remotely." P28	"The rotator will usually present the case, and if the PICU on-call feels that information was not enough, he/ she fills the gap." P27

(*Continued*)

Table 3 (Continued).

Background	"Because of the new COVID situation, some of the team members would not be aware of what happened to the patient last week except through this Zoom meeting …." P4 "Detailed background could be obtained through remote handover" P32 "The background information of the patient is the first thing we mention during handover, so it is well achieved." P20	"It's (background information of the patient) partially achieved because sometimes we lose attention and get some background information lost. While in face-to-face, we are less likely to be distracted." P28
Assessment	"(Patient) assessment of the previous team is always mentioned." P3 "Assessment was clear and backed with some radiological images or other documents sharing through (Zoom® platform)." P9	"Proper assessment needs more than virtual handover, needs personal assessment and clinical examination." P20
Recommendation	"We can take recommendations directly from the consultant remotely." P8	"Due to incomplete assessment, an effective plan couldn't be suggested properly." P20 "This is partially achieved because we don't really request anything during handover other than mentioning that the patient should be seen by the neurology team, for instance." P32

and 32 explained the advantage of Zoom handover without compromising patients' care. In addition to "less noise," Participant 28 believed that not conducting the handover at the bedside decreased the interruptions from individuals outside the PICU team during rounds. Considering the COVID-19 pandemic, Participant 9, a consultant, noted that remote handover had reduced stress among HCW and improved care provision. Alternatively, some participants believed that "missed information and discussions" are commonly observed during online handover. However, three participants observed that revising the patient's status is the senior's responsibility, regardless of the information shared during the handover. Participant 5, a resident, felt that sometimes, the low online attendance might negatively affect the quality of patient care. Furthermore, clinical assessment of the patient can be compromised due to remote handover, as explained in Table 3 by Participant 15. Connectivity issues have further influenced the quality of patient care, as explained by Participant 3.

While accepting the adverse effects of remote handover on the overall work environment, some physicians denied this effect on patient care. Participant 27 noted that "With the constraints enumerated above, there is always the possibility of miscommunication." However, when asked if that affects the quality of patient care, Participant 27 responded that "Patient care is the same with the face-to-face handover."

Quality of Online Communication

The descriptive analysis of the SBAR communication tool is shown in Figure 2. Among the 37 participants, 13 provided details based on their chosen SBAR communication tool evaluation.

Most participants were satisfied with the quality of communication using online applications, whereas others were less satisfied with the quality of communication for various reasons. The following shows the participants' responses to each element of the SBAR communication tool.

Situation

Most participants agreed that the explanation of each patient's situation during remote handover was clear and explicit. Some other participants noted no difference between the classic face-to-face handover and the online one, like the latter, according to participant 28, does not influence the handover contents.

Alternatively, few participants believed that providing a concise statement of the problem during the handover is overestimated, as Participant 27, a resident, noted that the team would search and fill the gap missed during the handover when at the bedside.

Background

Most participants believed that the patients' background information is well communicated during remote handover

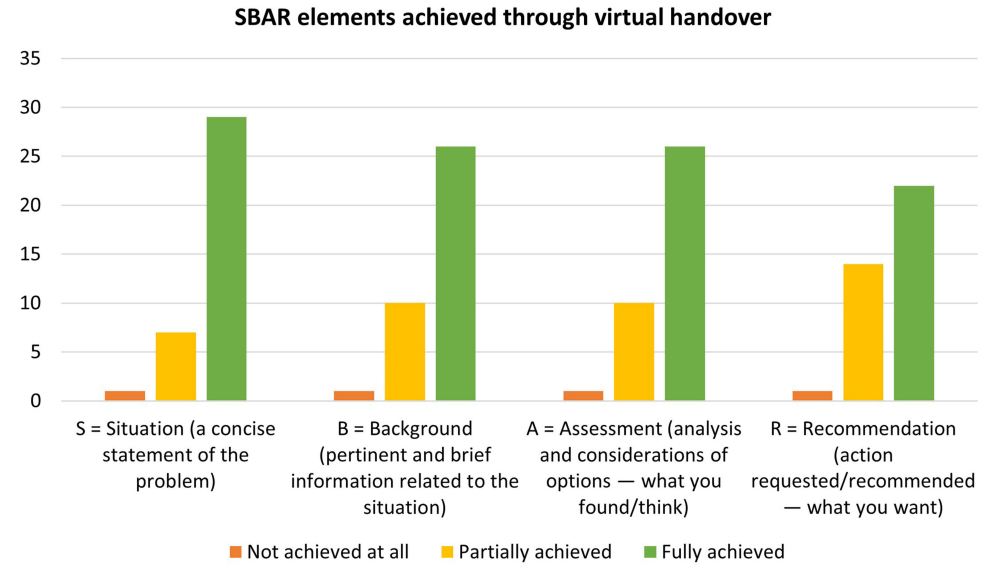

Figure 2 The participants' responses to achieving quality SBAR elements using online endorsement.

and understood the importance of this element, especially during the high turnover of patients due to COVID-19 admissions. For example, Participant 4, a resident, explained that some of the team members rely on the handover to get the update of the patients. The participants did not observe a difference in the quality of endorsing background information between online and face-to-face handovers, as stated by Participant 32. Nevertheless, few participants thought that a high-quality sharing of background information was partially achieved due to reasons explained in Table 3. In addition, Participant 31 noticed "Some missed information." Participant 31 believed that sharing background information was partially achieved and had not put the responsibility to fill the missing information on the on-call team.

Assessment

Like the SBAR mentioned above tool elements, most participants believed that the assessment findings of the patients were well communicated via remote handover. Furthermore, the participants explained some reasons that facilitated the perceived quality of communication of the team assessment of the patients. For example, Participant 9, a consultant, explained that assessment was clear as the handover was supported by other technological features of Zoom, such as sharing images and documents. However, some participants believed that communicating the assessment element is difficult to achieve through remote handover as this depends heavily on in-person clinical evaluation.

Recommendation

Some participants were satisfied with the quality of communication of recommendations during Zoom handover. For example, Participant 3 noted that "Plans and what to follow-up are clear."

Moreover, another participant added that consultants' availability to inform the team about and discuss recommendations is essential and easy to maintain during remote handover.

Alternatively, Participant 20, a consultant, believed that elements of the SBAR communication tool are connected. As he believed that if a proper assessment was lacking, then effective recommendations could be jeopardized.

Furthermore, some participants believed that most recommendations in the PICU do not require optimum communication skills, as explained by Participant 32 (Table 3). Infections:

Noteworthy, since the initiation of this remote handover process among the PICU physicians from 15 May 2020 to 15 Feb 2021, contact tracing in the PICU by the Infection Prevention and Control department reported only one physician who had a COVID-19-positive polymerase chain reaction result, which was community-acquired. Incidentally, among the other PICU team members who are not using the remote handover process, seven nurses (3 of them nosocomial) and two respiratory therapists (one nosocomial) were COVID-19 positive during this period.

Discussion

Tele-critical care reduces cost and improves the quality of care using low-cost, off-the-shelf, synchronous, video-teleconferencing devices, along with remote access to electronic medical records, imaging studies, and lab results.[21] Video-conferencing technologies, such as FaceTime®, Zoom®, and Skype®, were utilized to assist in family discussions and goals of care settings at the end of life in PICUs during the COVID-19 pandemic.[22] Therefore, we theorized that implementing a similar system during the pandemic could maintain the standard of ICU patient care while enabling more social distancing measures.

The handover of patients is critical of any hospital care, especially in settings with complex patients when multiple professions contribute to patient care. In addition, unambiguous and precise communication is provided by face-to-face communication.[23] However, virtual remote handovers using applications, such as Zoom®, make attending a session easier. A study has shown unanimous satisfaction of the participating neonatologists, nurses, and the infection control team.[24] In one study, physicians felt that their clinical decisions might be negatively impacted by inappropriate health information using online tools.[25] The satisfaction of the team involved is of immense help to sustain and improve virtual handover.

One of the participants in this study highlighted the avoidance of family members during the pandemic. However, note that the patient's or family members' presence may enrich the handover as they provide valuable input.[26] Virtual huddles to enhance staff communication about patients had been used in ICUs during the COVID-19 pandemic. However, it was feared that the speedy adaptation of virtualization might pose the risk of decreasing the quality of clinical care.[27,28] On the contrary, one study has shown that virtual programs may provide additional inpatient capacity during the COVID-19 pandemic.[29]

Most participants in this study were comfortable using Zoom® or other similar applications in the handover process, which could be related to their previous experience in using these tools. Lowe and Shen have reported their emergency department's rapid adaptation of telemedicine network using off-the-shelf products with Apple iPads running Zoom, a familiar system for end-users for physical distancing, reducing high-risk contacts and conserving PPE.[30]

However, the use of video cameras throughout the handover process could have intensified the team's reliability and engagement. This needs further exploration and emphasis, as body language is an integral component in the communication process. Paying attention to the types of nonverbal communication in face-to-face handovers and educating HCWs could improve the quality and reliability of these practices.[31]

In this study, the participants find communication and elaboration difficult in remote handover, which may make achieving a quality handover difficult; however, the so-called electronic ICUs have been established during the COVID-19 crisis to enable clinicians to monitor the clinical status of up to 100 patients spontaneously, provide them rapid access to subspecialty consultation, and allow the continued ability of quarantined staff to continue their work remotely.[32]

Even though most participants were post-graduate residents, one possible limitation is their high turnaround, and they may not grasp the whole experience. Implementing virtual handover and telemedicine at other clinical areas within the scope of their rotations may provide additional experience and perspective, which should be further evaluated. Residents' and trainees' opinions on Zoom's use in the clinical practice during the COVID-19 crisis were wildly varied, which is common in narrative analyses.[33] A recent cross-sectional survey that evaluated post-graduate residents' knowledge on infection prevention and control practices did not show any difference in overall knowledge by age, residency year, or rotating department.[34]

Some of our training residents thought the whole handover process does not affect the patient care in the PICU, thinking that this relates more to the PICU senior staff themselves rather than relating to the trainees. This misconception highlights that training residents need more education on how proper handover affects the quality of patient care and safety.[35] Having all PICU team members share the handover information about a patient's current situation, assessments, and care recommendations could prevent near misses and adverse events.[35] Unfortunately, such vital information does not always pass flawlessly from the previous to the subsequent healthcare providers. The Agency for Healthcare Research and Quality has reported several gaps in communication between healthcare providers as the leading cause of preventable medical errors in malpractice claims affecting emergency physicians and trainees.[36]

Few evidence exists on the effectiveness of SBAR implementation on patient outcomes, but this evidence is limited to specific circumstances, such as communication over the phone.[20] While SBAR is a recommendation of the hospitals' accreditation, in a national survey, around one-fourth of ICU

HCWs were not aware of the (SBAR) method of patients' handover.[37] As high-quality studies are still lacking, future studies are needed to demonstrate the benefit of SBAR in patient safety and raise awareness of communication errors. Till then, SBAR might be an adaptive tool suitable for many healthcare settings when clear and effective interpersonal communication is required.[20]

The current COVID-19 pandemic provides numerous opportunities for using remote communication to develop healing human relationships. What we need in a pandemic is not social distancing, but physical distancing with social connectedness.[38]

A multidisciplinary conference (MDC) is a specialized meeting between a diverse set of specialties that address patients' conditions from all aspects.[39] The inherent purpose of MDC is to ensure a thorough evaluation of each case, regardless of the spectrum of care, whether pretreatment, treatment, or survivorship.[39] This entails ensuring proper diagnosis, staging, treatment planning, clinical trial enrollment, care coordination, management of treatment complications, evaluation of disease response, recurrence monitoring, and assessment of survivorship outcomes. As MDC usage has become more widespread, academic institutions are beginning to evaluate MDC quality measures for guideline adherence and patient outcomes. Given its impact, MDC has become a standard in pediatric critical care.

A virtual MDC makes attendance easier, particularly for off-site healthcare providers. This encourages greater participation for community healthcare providers. The virtual format provides flexibility for on-site healthcare providers as well, promoting attendance. Images are more easily viewed by both neuroradiologists and MDC participants when a virtual format is employed. Furthermore, by attending an MDC at their workstation, healthcare providers have real-time access to patient records, which can be reviewed to assist with clinical decision-making.

Family-centered care is threatened during the COVID-19 pandemic.[40] The participation of family members in a manner that allows families, patients, and the healthcare team to collaborate is the core of family-centered care. Strategies for delivering family-centered care typically include the open presence of family members at the bedside. Restrictions on family presence should not undermine adherence to the principles of family-centered care. Defining patients' goals of care is a priority during the pandemic and typically necessitates family engagement. Therefore, rapidly adapting family-centric procedures and tools is essential to circumvent restrictions on physical presence. During the COVID-19 pandemic, family presence must be supported in nonphysical ways to achieve family-centered care.[40]

This study helps in optimizing digital approaches during the COVID-19 outbreak and future pandemics, highlighting the logistical and technical need, and impact on cost-effectiveness and quality of patient care as called by other researchers.[41] In a viewpoint paper that reviewed current pediatric challenges during the pandemic, easier access to healthcare using technology was among the highest opportunities.[42] There are few lessons earned from this study. The use of virtual technology would require standardization to reduce variation and enhance the experience. There is also a need to be visible to the patient's family and have them engaged during the discussion, and this could be accomplished by providing a brief explanation to the family. Utilizing virtual rounds would also require keeping the healthy mind of our patients. High-quality studies are still lacking on the effectiveness of SBAR as it relates to patient safety. We need further studies to elaborate on utilizing physical distancing with social connectedness to the best of the advantage of technology. It is also important to develop quality measures and outcome parameters for healthcare professionals to evaluate virtual handover tools.

This study is not without limitations. In terms of study design, focus group discussions using an open-ended semi-structured guide was difficult to perform due to physicians' busy schedule. Respondents' narratives to open-ended questions were used as the most convenient qualitative technique to collect data from the physicians without imposing their busy schedules. Further research could utilize available resources to enhance physicians' participation in focus group discussions and one-to-one interviews. A limitation to our research is the subjective component inherent to this study design, and hence both emic and etic perspectives were involved in the analysis of the data. The study reflects a single-center experience that could be further explored in multicenter trials utilizing similar remote handover applications in the ICUs.

Conclusions

Video-conferencing applications used for online handovers could supplement traditional face-to-face ICU patient handovers during infectious disease outbreaks. The utilization of video streaming and more emphasis on teaching should be encouraged to optimize the users' experience.

Abbreviations

CDC, Centers for Disease Control and Prevention; COVID-19, coronavirus disease 2019; ICU, intensive care unit; KSUMC, King Saud University Medical City; MDC, multidisciplinary conference; PCR, polymerase chain reaction; PICU, pediatric intensive care unit; PPE, personal protective equipment; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; WHO, World Health Organization.

Data Sharing Statement

All the data for this study will be made available upon reasonable request.

Ethics Approval and Consent to Participate

The study was approved by the institutional review board of King Saud University (approval # 20/0553/IRB). All participants have consented in the first part of the survey that their participation was voluntary and that completing the survey includes your consent to have data published. This study was conducted in accordance with the Declaration of Helsinki.

Consent for Publication

All authors gave their consent for publication.

Acknowledgments

The authors are grateful to the Deanship of Scientific Research, King Saud University, for funding through Vice Deanship of Scientific Research Chairs. We also would like to thank the Research chair for Evidence-Based Health Care and Knowledge Translation for support and Dr.Samia Ahmed Ismaeil for her efforts.

Author Contributions

MHT, NA, JAA, FAJ, AAE, MB, and RH conceptualized the study, analyzed the data, and wrote the manuscript. FAS, AAH, KAH, AA, MAM, MAH, and RT contributed to the study design; collected, analyzed, and interpreted data; and edited the manuscript. NA contribution to the study design and interpretation and edited the manuscript. AJ interpreted the data and finalized the manuscript. All authors reviewed and approved the final version of the manuscript. All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors declare no conflicts of interest for this work.

References

1. World Health Organization. WHO director-general's opening remarks at the media briefing on COVID-19-18 March 2020; 2020 Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19—18-march-2020. Accessed July 5, 2020.
2. Jones NR, Qureshi ZU, Temple RJ, et al. Two metres or one: what is the evidence for physical distancing in covid-19? *BMJ*. 2020;370:m3223. doi:10.1136/bmj.m3223
3. Ebrahim SH, Ahmed QA, Gozzer E, et al. *Covid-19 and Community Mitigation Strategies in a Pandemic*. British Medical Journal Publishing Group; 2020.
4. Al-Tawfiq JA, Garout MA, Gautret P. Preparing for emerging respiratory pathogens such as SARS-CoV, MERS-CoV, and SARS-CoV-2. *Infez Med*. 2020;28(suppl 1):64–70.
5. Al-Tawfiq JA, Al-Yami SS, Rigamonti D. Changes in healthcare managing COVID and non-COVID-19 patients during the pandemic: striking the balance. *Diagn Microbiol Infect Dis*. 2020;98(4):115147. doi:10.1016/j.diagmicrobio.2020.115147
6. Temsah MH, Al Huzaimi A, Alrabiaah A, et al. Changes in healthcare workers' knowledge, attitudes, practices, and stress during the COVID-19 pandemic. *Medicine (Baltimore)*. 2021;100(18):e25825. doi:10.1097/md.0000000000025825
7. Temsah MH, Alhuzaimi AN, Alamro N, et al. Knowledge, attitudes, and practices of healthcare workers during the early COVID-19 pandemic in a main, academic tertiary care centre in Saudi Arabia. *Epidemiol Infect*. 2020:1–29. doi:10.1017/S0950268820001958
8. Arora VM, Chivu M, Schram A, et al. Implementing physical distancing in the hospital: a key strategy to prevent nosocomial transmission of COVID-19. *J Hosp Med*. 2020;15(5):290–291. doi:10.12788/jhm.3434
9. Radovic A, Badawy SM. Technology use for adolescent health and wellness. *Pediatrics*. 2020;145(Suppl2):S186–s94. doi:10.1542/peds.2019-2056G
10. Ramsey WA, Heidelberg RE, Gilbert AM, et al. eHealth and mHealth interventions in pediatric cancer: a systematic review of interventions across the cancer continuum. *Psychooncology*. 2020;29(1):17–37. doi:10.1002/pon.5280
11. Badawy SM, Cronin RM, Hankins J, et al. Patient-centered ehealth interventions for children, adolescents, and adults with sickle cell disease: systematic review. *J Med Internet Res*. 2018;20(7):e10940. doi:10.2196/10940
12. Badawy SM, Kuhns LM. Texting and mobile phone app interventions for improving adherence to preventive behavior in adolescents: a systematic review. *JMIR Mhealth Uhealth*. 2017;5(4):e50. doi:10.2196/mhealth.6837
13. Badawy SM, Barrera L, Sinno MG, et al. Text messaging and mobile phone apps as interventions to improve adherence in adolescents with chronic health conditions: a systematic review. *JMIR Mhealth Uhealth*. 2017;5(5):e66. doi:10.2196/mhealth.7798
14. Payne HE, Lister C, West JH, et al. Behavioral functionality of mobile apps in health interventions: a systematic review of the literature. *JMIR Mhealth Uhealth*. 2015;3(1):e20. doi:10.2196/mhealth.3335

15. Zhao J, Freeman B, Li M. Can mobile phone apps influence people's health behavior change? An evidence review. *J Med Internet Res*. 2016;18(11):e287. doi:10.2196/jmir.5692
16. Shah AC, Badawy SM. Telemedicine in pediatrics: systematic review of randomized controlled trials. *JMIR Pediatr Parent*. 2021;4(1):e22696. doi:10.2196/22696
17. Patterson ES, Wears RL. Patient handoffs: standardized and reliable measurement tools remain elusive. *Jt Comm J Qual Patient Saf*. 2010;36(2):52–61. doi:10.1016/S1553-7250(10)36011-9
18. Waclawski E. How I use it: survey monkey. *Occup Med (Chic Ill)*. 2012;62(6):477. doi:10.1093/occmed/kqs075
19. CBAHI. *National Hospital Standards*. 3rd ed. Saudi Central Board for Accreditation of Healthcare Institutions (CBAHI); 2015.
20. Müller M, Jürgens J, Redaèlli M, et al. Impact of the communication and patient hand-off tool SBAR on patient safety: a systematic review. *BMJ Open*. 2018;8(8):e022202. doi:10.1136/bmjopen-2018-022202
21. Fusaro MV, Becker C, Scurlock C. Evaluating tele-ICU implementation based on observed and predicted ICU mortality: a systematic review and meta-analysis. *Crit Care Med*. 2019;47(4):501–507. doi:10.1097/ccm.0000000000003627
22. Bettini EA. COVID-19 pandemic restrictions and the use of technology for pediatric palliative care in the acute care setting. *J Hosp Palliat Nurs*. 2020;22(6):432–434. doi:10.1097/njh.0000000000000694
23. Solet D. Lost in translation: challenges and opportunities during physician-to-physician communication during patient handoffs. *Acad Med*. 2005;80(12):1094–1099.
24. Wasserteil N, Nun AB, Mimouni FB, et al. Handover of patients: the challenges of COVID-19. *J Perinatol*. 2020;40(10):1453–1454. doi:10.1038/s41372-020-00792-y
25. Townsend A, Leese J, Adam P, et al. Ehealth, participatory medicine, and ethical care: a focus group study of patients' and health care providers' use of health-related internet information. *J Med Internet Res*. 2015;17(6):e155. doi:10.2196/jmir.3792
26. Committee WCCIS. 11–12 June 2006 meeting. Also London declaration, patients for patient safety, WHO world alliance for patient safety. 29 March 2006.
27. Kleinpell RM. ICU workforce: revisiting nurse staffing. *Crit Care Med*. 2014;42(5):1291–1292. doi:10.1097/CCM.0000000000000202
28. Webster P. Virtual health care in the era of COVID-19. *Lancet*. 2020;395(10231):1180–1181. doi:10.1016/s0140-6736(20)30818-7
29. Sitammagari K, Murphy S, Kowalkowski M, et al. Insights from rapid deployment of a "virtual hospital" as standard care during the COVID-19 pandemic. *Ann Intern Med*. 2020;174(2):192–199. doi:10.7326/m20-4076
30. Lowe J, Shen S. Off the shelf: rapid deployment of an emergency department telemedicine platform using readily available consumer products. *J Emerg Med*. 2020;59(5):726–729. doi:10.1016/j.jemermed.2020.09.026
31. Frankel RM, Flanagan M, Ebright P, et al. Context, culture and (non-verbal) communication affect handover quality. *BMJ Qual Saf*. 2012;21(Suppl 1):i121–8. doi:10.1136/bmjqs-2012-001482
32. Hollander JE, Carr BG. Virtually perfect? Telemedicine for COVID-19. *N Engl J Med*. 2020;382(18):1679–1681. doi:10.1056/NEJMp2003539
33. Vaismoradi M, Turunen H, Bondas T. Content analysis and thematic analysis: implications for conducting a qualitative descriptive study. *Nurs Health Sci*. 2013;15(3):398–405. doi:10.1111/nhs.12048
34. Barry M, Alhadlaq G, Alsergani R, et al. Knowledge and attitudes toward preventing hospital-acquired infections among nurses and residents at a university hospital. *J Nat Sc Biol Med*. 2020;3(4):272.
35. Rourke L, Amin A, Boyington C, et al. Improving residents' handovers through just-in-time training for structured communication. *BMJ Qual Improv Rep*. 2016;5(1):u209900.w4090. doi:10.1136/bmjquality.u209900.w4090
36. AHRQ. Handoffs and signouts. Available from: https://psnet.ahrq.gov/primer/handoffs-and-signouts. Accessed February 10, 2021.
37. Temsah MH, Al-Sohime F, Alhaboob A, et al. Adverse events experienced with intrahospital transfer of critically ill patients: a national survey. *Medicine (Baltimore)*. 2021;100(18):e25810. doi:10.1097/md.0000000000025810
38. Bergman D, Bethell C, Gombojav N, et al. Physical distancing with social connectedness. *Ann Fam Med*. 2020;18(3):272–277. doi:10.1370/afm.2538
39. Dharmarajan H, Anderson JL, Kim S, et al. Transition to a virtual multidisciplinary tumor board during the COVID-19 pandemic: University of Pittsburgh experience. *Head Neck*. 2020;42(6):1310–1316. doi:10.1002/hed.26195
40. Hart JL, Turnbull AE, Oppenheim IM, et al. Family-centered care during the COVID-19 era. *J Pain Symptom Manage*. 2020;60(2):e93–e97. doi:10.1016/j.jpainsymman.2020.04.017
41. Badawy SM, Radovic A. Digital approaches to remote pediatric health care delivery during the COVID-19 pandemic: existing evidence and a call for further research. *JMIR Pediatr Parent*. 2020;3(1):e20049. doi:10.2196/20049
42. Serlachius A, Badawy SM, Thabrew H. Psychosocial challenges and opportunities for youth with chronic health conditions during the COVID-19 pandemic. *JMIR Pediatr Parent*. 2020;3(2):e23057. doi:10.2196/23057