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Fighting the Same Battles on a New Battleground: Embedding Technologies in a Virtual Care Environment

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Abstract. The pandemic necessitated the rapid design, development and implementation of technologies to allow remote monitoring of COVID-19 patients at home. This study aimed to explore the environmental barriers and facilitators to the successful development and implementation of virtual care technologies in this fast-paced context. We interviewed eight staff at a virtual hospital in Australia. We found key facilitators to be a learning organizational culture and strong leadership support. Barriers included interoperability issues, legislative constraints and unrealistic clinician expectations. Also, we found that a combination of hot-desking and the lack of single sign on in the virtual care environment, was reported to create additional work for staff. Overall, despite this unique context, our findings are consistent with prior work examining design and implementation of healthcare technologies. The fast pace and high-pressure environment appeared to magnify previously reported barriers, but also cultivate and foster a learning culture.

Keywords. Health informatics, implementation, virtual care, COVID-19

1. Introduction

To manage the large numbers of patients affected by COVID-19 and mitigate the risk of shortage of hospital resources [1], virtual care health services were rapidly developed and deployed across hospitals in Australia and internationally. A virtual care health service consists of virtual model(s) of care situated in a virtual care environment which typically consists of technologies for tele/videoconferencing, remote monitoring, and clinical decision support [1,2].

Prior research has reported on experiences, challenges and lessons learned from the rapid design, development and implementation of specific technologies supporting the management of the pandemic [3-5]. Frequently reported challenges have included

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technical issues with internet and phone reception, poor patient digital literacy [4] and difficulties in predicting staffing requirements in relation to the number of patients [3]. However, there is a paucity of research on how an environment supports the rapid design and implementation of multiple clinician- and patient-facing technologies. As such, the aim of this study was to determine the environmental barriers and facilitators to fast-paced development and implementation of virtual care technologies.

2. Methods

2.1. Study site

This study was conducted at a virtual hospital in Australia. The virtual hospital is equipped with care pods (workspaces) with videoconferencing, telephone facilities, access to the electronic medical record (EMR) and remote monitoring tools. The facility was staffed by nurses, allied health and medical staff, and supervised by a clinical director and director of nursing.

2.2. Participants

Eight staff at the virtual hospital, including representation from clinical and non-clinical roles, were recruited to participate in interviews by email with assistance from the hospital's staff specialist. Recruitment occurred between July and September 2022. Participation in this study was voluntary and no remuneration was provided.

2.3. Procedure

Participants were asked a number of questions to elicit their views on the environment where rapid design, development and implementation of technology has been occurring since the COVID-19 pandemic. Interviews were primarily conducted online, recorded and transcribed verbatim. De-identified transcripts were then thematically analysed independently by two researchers (ABA and MB) who extracted barriers and facilitators of rapid design, development and implementation of technology in the virtual care environment. The two researchers met frequently throughout data collection to compare themes. Any disagreements in themes were discussed until a consensus was reached. Ethics approval was obtained from the hospital's Human Research Ethics Committee.

3. Results

The interviews were 57 minutes on average in duration [range: 32 to 93 minutes]. Factors that facilitated rapid design and implementation of technologies included: a perception that the facility was a leader in virtual care; organizational culture, including a learning culture; technologically-advanced environment; and leadership support. The barriers included hot desking; need to manage clinician expectations; legislation and systems not keeping up with pace of change; and interoperability challenges.

3.1. Facilitators

Participants perceived the virtual hospital as a leader in virtual care due to its innovative and patient-centred approach. The virtual hospital was seen to challenge the normal hospital system, thus pioneering change. Participants also noted the availability of resources to facilitate rapid change: "*There's obviously a lot of attention and money being thrown at this unit. And, you know, it doesn't go unnoticed by the staff that we do have the best of everything here to make that happen*."

Regarding the organisational culture, participants reported a flat structure with excellent internal communication. They also highlighted that staff were agile, competent and adaptable, and that a learning culture had emerged to enable continuous improvements to processes and technologies. "*So everyone is working very collaboratively for things to be implemented efficiently, but also quickly …And I think it's purely based on the fact that we got so used to it with the rapid changes with COVID. And we knew we had to adapt to the change very quickly*." Furthermore, participants reported strong leadership support for new virtual models of care. They noted that the executive staff work collaboratively and listen to staff feedback.

Participants described the environment as technologically advanced, compared with brick and mortar hospitals, with many clinician-clinician technologies, remote monitoring technologies and clinician-patient technologies in use. A participant described the gamified feature of one of the tools: "*we've got our clinician to patient tools, like* [app name], *it gamifies your own care a little bit. So you can win prizes, gift vouchers and stuff through the app, as you complete the tasks required for your care*."

3.2. Barriers

Some negative consequences of the use of hot desks (i.e. flexible workstations) were reported. Participants mentioned not having single-sign on functionality across various apps and hot-desking as challenges: "*… the downside, we hot desk, meaning each nurses can jump from computer to computer on any given day, or even throughout the shift, you may need to move. And essentially logging into the computer, you're setting up over 10 platforms, or 10 apps that you need to use. Each app requires your staff login. And it's a repetitive process every single day, every single app."*

Participants also noted the importance of managing expectations of clinicians who transition from non-virtual hospitals to a virtual hospital environment: "*Yeah, I've been working as a clinician for 10 years now. And it was a completely different feeling. Because number one, I've never done a desk job per se, like an eight to five job. Like it's just meetings … the way we do things virtually it's just completely different. So a bit of a steep learning curve. Like working in ED, I don't have to do Excel sheets*." Due to the fast pace at which technologies are implemented at the virtual hospital, participants reported that rapid response to change has become a normal expectation of staff working in the virtual environment, which is different from expectations in non-virtual hospitals: "*if I was in a hospital, my expectations are lower. For* [this virtual hospital], *we get things approved quite quickly, implementation quite quickly, and expectations for nurses* [to] *use it quite quickly*."

Another barrier identified by staff was legislation not keeping up with pace of change. For example, a participant stated that "*a lot of systems are built around legislation. And the change in those legislations then mean, we're able to do what we*

want to do. Because at the moment, the definition of a hospital is not what we are in terms of what we want to do."

In addition, participants noted multiple layers of interoperability challenges. First, participants stated that within the hospital, multiple systems, including those used in the virtual hospital, are not well integrated: "*And it's the same as in the hospital…everyone uses a different service. And you can't see this when you work in there… and I don't think the whole system is streamlined*." Second, participants noted poor inter-hospital interoperability, "*And in terms of the hospital … I can't see what* [other] *Hospital writes in the EMR*". Third, participants highlighted interoperability challenges with external stakeholders such as ambulance services, "*…if I want to see the ambulance notes, I can't see it … I don't have access. And they can't see our EMR as well*."

4. Discussion

The pandemic increased the pace, urgency and need for technology-enabled virtual care. This led to rapid delivery of health technology which required swift implementation and uptake for the delivery of virtual models of care. Our study reveals environmental factors conducive to the rapid implementation and uptake of virtual care technologies.

A key finding was that a technology-enabled environment is not in itself sufficient to drive the success of the rapid implementation of technologies but *organisational capacity* factors [6] such as a learning culture, leadership support and other drivers of change are imperative. Our findings are consistent with that of a systematic review of factors affecting healthcare providers' rapid uptake of technologies, as they found that leadership support and positive organisational culture are key requirements for successful implementation of technology [7]. Consistent with our findings, heavy investment in technology infrastructure [8] and organisational readiness for change [9] have also been previously identified as enablers of successful technology implementation in healthcare organisations, thus not unique to virtual care environments.

When compared with the past few decades, we found that underlying challenges such as interoperability remain a problem [10], and persist in a virtual care environment (a new 'battleground'). However, this challenge seemed exacerbated in the virtual care environment as providers largely rely on electronic health information collected along the patient journey, particularly in the absence of physical contact with patients [11].

We also identified a new barrier, unique to the virtual care environment, relating to the virtual care workspace system. Previous studies have highlighted challenges associated with doctors hot-desking in public hospital settings [12], such as erosion of privacy, and additional work [13], and our study adds to this evidence by highlighting practical challenges stemming from the use of hot desks with the lack of a single sign on functionality. This finding brings to fore human factors considerations in virtual care environments, suggesting that workspaces and the broader environment housing various technologies should be optimised to meet user needs, avoid duplication of work, and support mobile and agile workflows.

5. Conclusions

This study has revealed that wicked problems transcend normal healthcare delivery environments and that they occur, and can be exacerbated, in virtual care environments,

particularly when technology is rapidly implemented. To support the rapid implementation of virtual care technologies, we recommend the adoption of interoperable systems, a thorough consideration of 'work as done' when designing workspaces, mechanisms for rapid policy changes, and the management of clinicians' expectations via a variety of avenues (e.g. orientation) when transitioning from brick-and-mortar to virtual hospitals.

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