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Antimicrobial Stewardship (AMS) During COVID-19: Eyes and Ears on the AMS Team

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Abstract. Antimicrobial stewardship (AMS) programs in hospitals comprise coordinated strategies to optimise antimicrobial use. The COVID-19 pandemic had a significant impact on the healthcare system, including AMS. This study aimed to understand the work processes of AMS teams during COVID-19 hospital restrictions and the role technology played in supporting AMS. Observations and interviews were conducted with AMS teams at two hospitals in Sydney, Australia. Participants reported an increase in antimicrobial use, a loss of resources for AMS activities, and reduced in-person interactions. Meetings were performed through videoconferencing, which resulted in greater access to information but led to poorer communication and impacted interdisciplinary relationships. As COVID-19 restrictions recede, AMS program changes should be evaluated to understand the most effective strategies to facilitate evidence-based AMS practices.

Keywords. antimicrobial stewardship, antibiotics, qualitative, COVID-19

1. Introduction

Antimicrobial resistance is an imminent threat to our society and is exacerbated by inappropriate antimicrobial use [1]. Antimicrobial stewardship (AMS) is viewed as critical for improving antimicrobial prescribing practices in hospitals. AMS programs comprise a collection of strategies to optimise antimicrobial prescribing, such as auditing antimicrobial use, restricting high-risk antimicrobials, the provision of guidelines, education, and interdisciplinary meetings and targeted case discussions. AMS programs include hospital governance structures and an AMS team made up of infectious disease and microbiology doctors, and AMS pharmacists. These AMS teams have the complex task of influencing antimicrobial prescribing behaviour, a task often challenged by prescriber autonomy and complex social hierarchies. With the introduction of digital interventions to facilitate AMS, these programs have become complex socio-technical

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systems [2]. AMS programs with the aid of digital interventions have been shown to improve antimicrobial prescribing in hospitals [2].

The COVID-19 pandemic disrupted all facets of the healthcare system, including AMS both directly and indirectly. The complexity of the COVID-19 disease presentation led to increased and often unnecessary antimicrobial prescribing [3]. As COVID-19 cases increased, social distancing and reduced in-person patient and provider contact was implemented. These restrictions resulted in changes to the way healthcare staff worked and interacted with each other and with patients, and the way technology was utilized [4]. The aim of this study was to understand the work processes of AMS teams during COVID-19 hospital restrictions and the role technology played in supporting AMS.

2. Method

2.1. Study Design and Setting

A contextual inquiry methodological approach was used, including observations and semi-structured interviews conducted at two public teaching hospitals in Sydney. Both hospitals had the same electronic medication management (eMM) system. Data were collected between May 2021 and August 2022. During some of this time, restrictions were imposed by the New South Wales Government and hospitals, preventing the public from entering hospitals and limiting in-person interactions. This study was approved by Sydney Local Health District Human Research Ethics Committee (2020/ETH02859).

2.2. Participants and Procedure

Purposive sampling was used to recruit doctors and pharmacists from the AMS teams at both hospitals. Depending upon restriction rules, observations and interviews were conducted in-person or through videoconferencing software (Zoom). The System Engineering Initiative for Patient Safety (SEIPS) framework was used as a conceptual model to understand the impact of COVID-19 on AMS and identify elements which influenced the work system [5]. An interview guide was developed by the research team and informed by the SEIPS framework. During observations (27 hours), the researcher, experienced in qualitative research, recorded notes on AMS work processes with a focus on people, tools, tasks, and organisational factors. Two researchers met periodically to discuss the observational findings. Interviews were audio-recorded and transcribed verbatim. Interviews were analysed by one researcher using an inductive content analysis approach and coding was reviewed by a second researcher. Themes were then deductively mapped to the SEIPS framework.

3. Results

3.1. People

Fifteen participants were interviewed from AMS teams at the two hospitals (Table 1).

Table 1. Participants interviewed.

Hospital A	Hospital B
2 AMS Pharmacist 2 Infectious Disease Advanced Trainee 1 Microbiology Advanced Trainee 3 Infectious Disease and Microbiology Staff Specialists	1 AMS Pharmacist 2 Infectious Disease Advanced Trainee 1 Microbiology Advanced Trainee 3 Infectious Disease and Microbiology Staff Specialists

3.2. Technology and Tools

Participants reported that the eMM system facilitated doctors working remotely. The videoconferencing platform, Zoom, was frequently mentioned as being essential during restriction periods. *"Having the ability to do zoom meetings has been essential. If we didn't have that, then we wouldn't be able to do this in a way that was meaningful." (P1).*

One hospital had a dedicated phone that prescribers could call for antimicrobial advice and approvals. This was used for COVID-19 advice. *"So our AMS phone became the COVID advice line as well for [approval of] rapid testing for COVID" (P1).*

3.3. Tasks

During the restriction periods, all meetings were conducted on Zoom. Observations of Zoom meetings revealed some barriers to communication. Doctors would call from busy settings such as the intensive care unit (ICU) where there was a lot of background noise, or from mobile phones when having difficulties accessing Zoom on a computer. Communication was also perceived as an issue by participants in the interviews. "*Because basically, you'd be on this Zoom meeting, and it'd be a hunt. It was a very crowded space with all these bells and whistles beeping, and no one could really hear what was going on. It's quite hard to develop that personal relationship we usually like to have." (P2)*

When comparing in-person and zoom meetings, observations showed more doctors from the medical teams attended multidisciplinary team meetings when conducted in-person compared to online. This was confirmed by participants in the interviews. "*We found that AMS just kind of retracted into a core group of ID physicians, microbiologists, and AMS pharmacists with very occasional celebrity appearances by other units but didn't have the same level of engagement." (P11)*

During Zoom meetings, observations revealed that participants viewed patient information on the eMM system from their respective computers and/or utilised the share screen function. In interviews several participants reported that having access to patient information and being able to provide information through the chat function were benefits of Zoom meetings. *"Something that was good about zoom meetings was, you know, you had a little chat function, and you could just provide them approval codes, and it was like, very easy to be looking at the results at the same time as you're listening to someone talking, and everybody had a computer." (P15)*

During in-person meetings in the ICU, the AMS team and ICU doctors were observed to look over at patients when discussing their care. In interviews, participants also mentioned this and said that viewing patients in-person was beneficial to antimicrobial discussions. "*It's much more profound to sit in an ICU round with an ICU consultant, and they say, I'm really worried about that person over there, have a look at them, you know, from here just have a look at how sick they look. And they look grey, or they look profoundly jaundiced or something like that. And you look over and you're like,*

yeah they really do look sick, and I can understand why you're giving the broad spectrum antimicrobials." (P13)

3.4. Organisation

Observations of in-person interactions revealed that when the AMS team was on the wards, this led to more ad hoc discussions between AMS staff and doctors. In interviews, most participants reported that the meetings on zoom negatively impacted relationships and rapport between the AMS team and prescribers. Participants also found in-person meetings more enjoyable and engaging. *"I mean, in-person's better. It's more engaging. It makes work more satisfying. You meet more people, and you probably are, like it's a bit ephemeral, but you probably like develop a little bit more of a trusting relationship with them, and so they're probably more likely to take your advice." (P15)*

When asked about the impact of COVID-19 on AMS, most participants reported a loss of resources or time, and a deprioritising of AMS. *"I think firstly, there's a resourcing issue. So I think AMS for a lot of hospitals has been kind of, from a resource perspective, and also the amount of pharmacy and infectious diseases time that can be dedicated AMS has suffered through COVID." (P12)*

One participant did raise concerns about the increased use of antivirals and the lack of governance with antiviral stewardship. "*In a few years' time, retrospectively, I think we're going to look back and say, did we actually use monoclonal antibodies, and did we actually use antivirals responsibly? Because I think there is a growing feeling that some of the variants have emerged because we have not used the medications in a responsible way." (P13)*

3.5. Environment

Regarding the location of work, observations and interviews revealed that COVID-19 restrictions normalised doctors in the AMS team working from home. When in the hospital, reviewing patients remotely was also common. *"I guess COVID normalised like a remote review. I do feel that prior to COVID, there was an expectation that, you know, if you review someone, you have to be on the ward." (P17)*

3.6. Outcomes

Most participants reported that there was increased use of antimicrobials during COVID-19. Participants also reported it was difficult to assess antimicrobial appropriateness due to the complexity of COVID-19 symptom presentation and difficulties conducting microbiological testing and audits. *"It also hampers AMS because people use antibiotics for COVID and it's very difficult at the ICU level to know whether it's viral or not." (P3)*

Antimicrobial use in COVID, I think, went a little bit bananas as well. So like, I had tried to conduct an audit about antimicrobial use in patients with COVID. So those who are suspected to be co-infected with bacteria. And even the respiratory team wasn't really particularly keen to proceed with that type of investigation, because they knew, I suspected, they knew that even they had blatantly used antibiotics in a kind of flippant or irresponsible manner." (P13)

4. Discussion

In this qualitative study, doctors and pharmacists in AMS teams reported COVID-19 led to an increase in antimicrobial use, a reallocation of AMS resources, and a change in work processes. In the SEIPS model, changes to individual factors influence the entire work system. The most significant change was the introduction of videoconferencing. Although this resulted in greater access to information, interviews and observations revealed Zoom meetings led to some communication issues, a reduction in meeting attendance, and negatively impacted rapport between teams.

Participants reported challenges in building relationships with other departments during COVID-19 and attributed this to fewer in-person interactions. Similar results were obtained in interviews with AMS teams in the United Kingdom (UK) and the United Arab Emirates (UAE) during COVID-19 [6,7]. AMS teams in the UK reported difficulties in building relationships and working collaboratively, and in the UAE AMS teams found remote review of patients to be less effective than in-person rounds. This is consistent with AMS program evaluations where it has been shown that in-person rounds are a key strategy in highly effective AMS programs [8].

Doctors and pharmacists perceived there was an increase in antimicrobial use and reported difficulties assessing antimicrobial appropriateness. This is in line with previous quantitative studies which have found increased antimicrobial prescribing in COVID-19 patients [3], even though the prevalence of community-acquired co-infection was low [9]. This emphasises a need to continue AMS strategies during COVID-19.

In summary, COVID-19 had a significant impact on antimicrobial prescribing practices and AMS work processes in the sites we investigated. At a time when antimicrobial use increased and AMS was most needed, AMS resources were reallocated and key strategies such as in-person meetings were converted to Zoom. As COVID-19 restrictions recede, there is now a need to evaluate the changes to AMS, understand the most effective strategies, and apply lessons learnt to facilitate evidence-based AMS practices in future high-pressure, low-resourced events, like viral pandemics.

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