

Research Paper

The pharmacist informatician: providing an innovative model of care during the COVID-19 crisis

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Abstract

Objectives The global coronavirus pandemic has expedited digitisation in every industry, especially healthcare, and has highlighted the potential for informatics pharmacists to provide valuable input into crisis management. Informatics pharmacists can combine their clinical and information technology skills to help provide essential patient safety services related to medication management, procurement and analytics. The objective of this study was to determine the key opportunities for a pharmacist informatician to improve patient care and outcomes during the COVID-19 pandemic.

Methods Fourteen expert informatics professionals involved in the provision of digital health in Queensland, Australia, were invited to participate in a brief semistructured interview. Transcripts were manually coded, through iterative readings of the text to identify participant responses related to opportunities for a pharmacist informatician to assist during COVID-19. Inductive thematic analysis as described by Braun and Clarke, was used to identify groups of text related to the provision of digital health, informatics and change of practice during a pandemic. The relevant codes were then grouped into themes to help answer the research question.

Key findings Twelve experts agreed to participate, they included nine informatics pharmacists and three digital health experts from hospital and community. Two key themes and 13 codes related to enabling safer and more efficient workflow and use of data analytics to optimise care were identified. The first theme related to 'social distancing without compromising care' for example, by using the electronic capabilities of digital hospitals and telehealth services. The second theme related to the use of real-time data streaming to optimise patient flow and timely medication procurement and management. Examples of quotes from transcripts were used to provide context and answer the research question.

Conclusions The experts interviewed identified areas where informatics pharmacists have the potential to assist with maintaining high quality patient care during this pandemic, and in future disasters. Improving awareness, training, and the integration about informatics roles as a result of this global pandemic will likely assist with future patient management in the event of future disasters.

Keywords: pharmacy; informatics; coronavirus; digital; health informatics

Introduction

The global coronavirus pandemic has expedited digitisation in every industry, especially healthcare. Embracing digital healthcare solutions, like telehealth, during the coronavirus pandemic has provided mechanisms to improve safe and appropriate patient care while maintaining physical distance.^[1] Additionally, since the physiology and medication requirements of coronavirus patients are unique, international informatics efforts have rapidly appeared in an attempt to provide accurate information to treating clinicians.^[2]

During disasters, pharmacists can utilise their expertise in medication management to assist with medication optimisation and procurement.^[3] Informatics pharmacists are those with skills in the areas of clinical management of patients using health information technology. While these roles do exist in Australia, they are not yet well established. The coronavirus pandemic has highlighted the potential for pharmacists to provide valuable input into crisis management.^[4-6]

In particular, the current pandemic has created a need for informatics pharmacists to use their clinical as well as digital expertise to help improve the delivery of health care. In hospitals that use integrated electronic medical records (or digital hospitals) there is the ability to use systems to provide timely decision support, improve provision of medication supply and real-time data analytics.^[7,8] The aim of this study was to determine the opportunities for an informatics pharmacist to improve patient care and outcomes during the COVID-19 pandemic.

Methods

Ethical approval was granted by The University of Queensland Health and Behavioural Science Committee (202000069).

Expert informatics professionals (pharmacists and others who were clinical and non-clinical) involved in the provision of digital health in Queensland, Australia were invited to participate in a brief semistructured interview. The research team contacted known Australian informatics experts through hospital and university contacts. Participants were recruited using purposive sampling and snowball methods, with a focus on recruitment of individuals who either worked in informatics pharmacist roles or with informatics pharmacists. Participants were contacted by a member of the research team with an invitation email. This email provided a synopsis of the study and invited them to participate in a 30-min interview regarding the roles and responsibilities of informatics pharmacists working in the Australian healthcare setting. Those that agreed to participate were provided with a participant information sheet and a consent form, which was signed and returned to the research team before the interviews. The target number of participants was 15 or as data saturation was reached. Approximately one to two interviews were conducted each week.

Semistructured interviews (face-to-face or videoconference) were used as they allow participants to provide in depth views on the topic of interest. Similar methods have been used successfully in other pharmacy related research.^[9-11]

Whilst interviews covered multiple topics related to the key roles and responsibilities of informatics pharmacists, only the coronavirus content will be presented here. The interviews were audio recorded and transcribed verbatim. De-identified transcripts, using pseudonyms (which appear in the exemplars), were analysed using inductive thematic analysis methods described by Braun and Clarke.^[12] Thematic analysis of the transcripts was conducted by a study investigator (NF) with prior experience in qualitative research methods and reliability tested by a second researcher (CS).

In accordance with the process of inductive thematic analysis, the transcripts were read on multiple occasions and coded by identifying sections of text that held informative responses that were related to informatics pharmacists and their roles during the COVID-19 crisis. Codes were later grouped according to themes. Themes and codes are presented in a table and discussed within the text. Examples of quotes from transcripts are used to provide context and assist with answering the research question.

Results

Twelve experts agreed to participate. Interviews were conducted from March to May 2020, and were approximately 30 min in duration. Participants worked primarily in a hospital setting or for Government in an area related to health informatics. Seven of the participants were pharmacists working clinically in digital hospitals (with complete electronic health records), or working in informatics roles in a hospital or community setting. The remaining five were specialists in digital informatics and digital systems in healthcare, working in either management of development roles. Saturation of information was reached by the 11th interview (with 12 interviews in total).

Key themes

The thematic analysis of interview transcripts identified two key themes related to enabling safer and more efficient workflow, and use of data analytics to optimise care. The first theme was 'social distancing without compromising care' and contained four codes. The second theme of 'data analytics to optimise patient care' contained two subthemes with a total of nine codes. Themes, subthemes and codes are shown in [Table 1](#).

Theme 1: social distancing without compromising care; subtheme working remotely

Participants discussed the advantages of digitally transformed hospitals, where systems such as an integrated electronic Medication Records (ieMR) have been implemented, enabling access to all aspects of a patient's clinical record throughout the continuum of care. This includes integrated access to the Australian amalgamated digital health record called My Health Record in the community setting, pre-admission clinic documents and all inpatient laboratory and medication related records during hospitalisation. Here Henry (all names are pseudonyms) explains how when comparing sites with digital systems versus paper records 'the core functionality of the ieMR has helped [digital] sites tremendously through the COVID-19 pandemic'.

Another participant, Ellen, discussed how during the pandemic 'unless you really need to be at the patient's bedside, you're not there... that reduces infection rates. If you have a fully digital hospital... I would have a conversation with a doctor virtually, via telehealth, while looking at a common medication chart'. This helps to efficiently create the necessary social distancing, whilst facilitating multidisciplinary patient care.

Others echoed similar ideas around increased feasibility for digital hospitals to rapidly change their model of practice to cope with implications of the pandemic for the work force. For example, by enabling staff to work remotely to review patients from the comfort of their home. Here Sarah explains: 'They can be in their own lounge and log into the ieMR and have the patient medication chart in front of them...they can ring the patient to complete their medication histories'.

Table 1 Themes and codes related to pharmacist informaticians and their role during COVID-19

Theme	Subtheme	Codes
Social distancing without compromising care	Working remotely	Digital hospitals
		Working from home Change in practice Telehealth Infection control
Real-time data streaming to optimise patient care	Patient flow	Patient movement Hospital flow Meaning from data Decision support
		Medication procurement
		Drug type and dosage Patient outcomes ICU data Accelerating analytics

Participants discussed how digital sites were able to operate with minimum staff, with some clinicians able to work off site, whilst contributing to key tasks required for day to day running of the pharmacy through remote dispensing practices. Sarah pointed out that ‘They even have the ability to remotely print labels so that they just have... skeleton staff in the pharmacy’. Others suggested a change in their model of care which may be adopted in the long term. This involved educating patients post discharge via phone or video conferencing, versus the traditional face to face discharge counselling.

Theme 2: real-time data streaming to optimise patientcare

Subtheme – patient flow

The importance of data analytics with respect to infection control and patient location, was discussed by participants. They identified that by extracting data on patients transfers from one ward to another, and monitoring patient movements throughout the hospital, an informatics pharmacist can work with infectious diseases and infection control services to implement safety measures for close contacts of COVID-19 patients, including healthcare staff, in a timely manner.

As Henry explains ‘the informatics pharmacist can create meaning from the data to inform other clinicians and the executive ... for example, regarding patient movements, they can start to map out things like how are the medications managed? Is there extra potential for infection to other patients in that area?’

Subtheme – medication procurement for seamless supply

Pharmacists with informatics expertise were described as essential, in particular in relation to analysis of data related to medication supply for COVID-19 patients. ‘How much of that drug will we need?’ is a question that many pharmacists have been asked over recent months, explained Ellen.

Interview participants discussed how this approach can facilitate timely supply of medications for the right patient, in the right location. They described how novel methods of interrogating the digital

hospital prescribing and dispensing data could be used to address these questions. Ellen also added how knowledge of digital systems could inform the development of mathematical models to make future projections for medication requirements, before exact information about treatments was available. They described having to think ‘quickly, critically and laterally’ to provide innovative solutions in an unprecedented healthcare crisis for a unique disease.

‘I’ve been able to go through the [intensive care unit] ICU data ... see what treatments they have used in the past for pneumonia. What treatments have been used for excessive inflammation and immune response. let’s model how much drug they needed for those cases, and when we do have COVID-19 admissions, we can look at that data and update the modelling as we go along’.

Working on the notion of accelerating the data analytics agenda, Jackie described how ‘It would be fantastic to be able create decision support to say that.... we should be using drugs such as benzodiazepines and preserving propofol for its pharmacological properties.... to help in the weaning process, so we can get people off the ventilators’. Participants described how clinical decision support tools are being developed and implemented to facilitate a real-time analysis and learning of medication related needs. Alex emphasised that pharmacists with an understanding of the digital systems and clinical expertise would be needed to review trends in medication use, specifically which medications were in greater demand, for which patients, in what quantities and for what duration.

Embracing the digitalisation of health

As health professionals, if COVID-19 has taught us anything it is that we must embrace the digital transformation of healthcare. Pharmacist informaticians are likely to play a key role in the optimal provision of these new models of care, as described by Judith:

‘We are all shifting from a person-based model ... to a population-based model. Instead of treating patients one by one as they come to the door, we have to, in a pandemic, shift to a population-based model. And that means understanding in an aggregated way the needs of the population and prioritising the care. So that is things like medication stewardships, supply chain and potentially rationing – If things get serious’.

Discussion

This study used semistructured interviews with experts in the field of clinical informatics to determine opportunities for informatics pharmacists to improve patient care during the COVID-19 pandemic. Through the process of thematic analysis two key themes emerged; (1) Social distancing without compromising care and (2) real-time data streaming to optimise patient care.

This study was conducted in the midst of the COVID-19 pandemic, with high demand on our healthcare workers. The positive responses from participants and their willingness to take part in the interviews reflects the enthusiasm and support for these roles. Our interviews included a small cohort of digital experts working in the Australian healthcare setting. Whilst we anticipate that their perspectives are likely to reflect that of local colleagues, a larger study is needed to obtain views of the international workforce and health systems, in particular where electronic health records may not be in routine use.

In the first theme participants described the advantages of the digital implementation of electronic health records, which enabled health professionals to work remotely, for example, by participating

in virtual patient rounds, or via remote dispensing of medications. With COVID-19 placing unprecedented demands on digital health, clinicians with expertise to utilise the digital hospital systems were seen as crucial. Although the literature is relatively silent on the role of clinical informaticians during the COVID-19 crisis, studies have highlighted the need for clinician input for successful implementation of electronic health records.^[13,14]

In the second theme of ‘real-time data streaming’, participants described how patient flow and medication procurement could be managed using data analytics to improve patient care. This was only feasible through the digital transformation of Australian hospitals, which have made clinical data available on a large scale, and in real time.^[15]

Medication supply and procurement were frequently cited by participants as likely to play a crucial role in the optimal management of the current pandemic, as well as future crisis management. This is in keeping with the findings of a 2019 study that aimed to define pharmacists’ roles during disasters.^[16] Researchers used a three round Delphi method, with 24 opinion leaders, and identified 21 key tasks where pharmacists would play a significant role. A number of roles related to provision of uninterrupted medication supply, rationing of medications and Coordinating logistics of medication supplies for patients with chronic diseases.^[16]

As outlined in the American Health System Pharmacist Statement (ASHP) on Pharmacist Roles in Informatics, pharmacists have the knowledge and are ideally positioned to ‘assume a significant role in clinical informatics’.^[17] Our findings also highlight the value of pharmacist informaticians, who can use their clinical and informatics skill sets to improve safety and decision making, using large volumes of patient data.

Future roles for informaticians

COVID-19 has expedited the demand for digital data to help provide timely and accurate clinical decisions. In the hospital setting, providers are increasingly becoming digital by design, and complete electronic health records are now available in many Australian hospital, and other hospitals around the world.^[18] This means that the role of informatics clinicians, such as pharmacists with a comprehensive knowledge of medications and related digital systems, is more vital than ever. As highlighted by interviews, acute healthcare is likely to extend outside of the hospital with remote monitoring and telehealth being utilised to support the delivery of healthcare while maintaining physical distancing.^[19] Such services, and informaticians who can facilitate their optimal implementation and maintenance, are essential in a COVID-19 world.^[1] The coronavirus pandemic has taught us that increased awareness, training and the integration of health professionals with digital know-how will improve the rigor of the health system and optimise care for our patients now, and in future disasters.^[20]

Key challenges for informaticians

Whilst the adoption of digital healthcare is well under way in many countries, and clinicians should embrace these innovations, they must also be mindful of the limitations. One potential pitfall is the over-reliance of clinicians on computerised systems for decision making, all digital tools must be used in a studious manner and recommendations from decision support tools must be filtered through clinical and experiential knowledge. Informatics pharmacists can play an important role in educating colleagues on using tools to help augment and support a clinician’s judgement, but not to override

their clinical knowledge. It is important to highlight that in contrast to a manual system where an error would only impact one patient, errors in digital systems can affect thousands of patients. Therefore, health professionals should be vigilant to proactively detect and report potential problems.^[21]

With new technologies also comes the threat of cyber security. Safety of digital health data is of vital importance. Informatics pharmacists should ensure they are involved in the design and implementation clinically sound systems that safe guard the privacy of the patients who are entrusted to their care.^[22]

Conclusion

The experts interviewed in this study identified key areas where informatics pharmacists have the potential to intervene and maintain high quality patient care during this pandemic, and in future disasters. Informaticians, in pharmacy and other professions, can provide valuable input when disasters occur.

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Author Contributions

Nazanin Falconer performed conceptualization, methodology formal analysis, investigation, resources, validation, data curation, writing (original draft), writing (review & editing), Corey Monaghan performed writing (original draft), writing (review & editing) and Centaine Snoswell performed conceptualization, methodology, resources, validation, data curation, writing (original draft), writing (review & editing)

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Conflict of Interest

The authors declare no conflict of interests.

References

1. Smith AC, Thomas E, Snoswell CL *et al.* Telehealth for global emergencies: Implications for coronavirus disease 2019 (COVID-19). *J Telemed Telecare* 2020; 26: 1–5.
2. Rubin R. Global effort to collect data on ventilated patients with COVID-19. *JAMA* 2020; 323: 2233–4. <https://doi.org/10.1001/jama.2020.8341>. PMID: 32401275.
3. Watson KE, Van Haaften D, Horon K *et al.* The evolution of pharmacists’ roles in disasters, from logistics to assessing and prescribing. *Can Pharm J* 2020; 153: 129–31.
4. Bukhari N, Rasheed H, Nayyer B *et al.* Pharmacists at the frontline beating the COVID-19 pandemic. *J Pharm Policy Pract* 2020; 13: 8.
5. Dawoud D. Emerging from the other end: key measures for a successful COVID-19 lockdown exit strategy and the potential contribution of pharmacists. *Res Social Adm Pharm* 2020; 1–4.
6. Gross AE, MacDougall C. Roles of the clinical pharmacist during the COVID-19 pandemic. *J Am Coll Pharm* 2020; 3: 564–6.
7. Reeves JJ, Hollandsworth HM, Torriani FJ *et al.* Rapid response to COVID-19: health informatics support for outbreak management in an academic health system. *J Am Med Inform Assoc* 2020; 27: 853–9. <https://doi.org/10.1093/jamia/ocaa037>. PMID: 32208481; PMCID: PMC7184393.

8. American Society of Health-System Pharmacists. ASHP statement on the pharmacist's role in clinical informatics: automation and information technology—statements. *Am J Health-Syst Pharm*. 2007; 64: 200–3.
9. Falconer N, Barras M, Cottrell N. How hospital pharmacists prioritise patients at high risk for medication harm. *Res Social Admin Pharm* 2019; 15: 1266–73. <https://doi.org/10.1016/j.sapharm.2018.11.003>. PMID: 30466812.
10. Chevalier BA, Watson BM, Barras MA *et al*. Hospital pharmacists' perceptions of medication counselling: a focus group study. *Res Soc Admin Pharm* 2016; 12: 756–71.
11. Béchet C, Pichon R, Giordan A *et al*. Hospital pharmacists seen through the eyes of physicians: qualitative semi-structured interviews. *Int J Clin Pharm* 2016; 38: 1483–96.
12. Braun V, Clarke V. *Successful Qualitative Research*. London: Sage Publications Ltd.; 2013.
13. Doebbeling BN, Chou AF, Tierney WM. Priorities and strategies for the implementation of integrated informatics and communications technology to improve evidence-based practice. *J Gen Intern Med* 2006; 21 (Suppl 2): S50–7.
14. Snyder CF, Wu AW, Miller RS *et al*. The role of informatics in promoting patient-centered care. *Cancer J* 2011; 17: 211–18.
15. Sullivan C, Staib A, Ayre S *et al*. Pioneering digital disruption: Australia's first integrated digital tertiary hospital. *Med Aust J* 2016; 205: 386–9.
16. Watson KE, Singleton JA, Tippet V *et al*. Defining pharmacists' roles in disasters: A Delphi study. *PLoS One* 2019; 14: e0227132.
17. American Society of Health-System Pharmacists. ASHP statement on the pharmacist's role in clinical informatics. *Am J Health-Syst Pharm* 2016; 73: 410–13.
18. Keasberry J, Scott IA, Sullivan C *et al*. Going digital: a narrative overview of the clinical and organisational impacts of eHealth technologies in hospital practice. *Aust Health Rev* 2017; 41: 646–664.
19. Monaghesh E, Hajizadeh A. The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence. *BMC Public Health* 2020; 20: 1193.
20. Traynor K. Pharmacists matter in pandemic response. *Am J Health Syst Pharm*, 2008; 65: 1792–3.
21. Sutton RT, Pincock D, Baumgart DC *et al*. An overview of clinical decision support systems: benefits, risks, and strategies for success. *NPJ Dig Med* 2020; 3: 17.
22. Jalali MS, Kaiser JP. Cybersecurity in hospitals: a systematic, organizational perspective. *J Med Inter Res* 2018; 20: e10059.