Pharmacists' Expectations and Perceptions of Electronic Medication Management

Lessons from Australia

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Abstract

Background: Implementing electronic medication management systems (eMMS) is likely to influence established work practices. *Objective:* To explore Australian hospital pharmacists' expectations of, or experiences with, eMMS. *Methods:* Semi-structured individual phone interviews with pharmacists from six Australian States and Territories were conducted in 2014. *Results:* A total of 18 pharmacists were interviewed. Pharmacists using what they perceived to be a well-designed eMMS appeared satisfied, reporting on increased work efficiency and improved medication safety, while pharmacists dissatisfied with the eMMS focused almost exclusively on negative effects of eMMS on time and patient safety. *Conclusions:* It is important to manage expectations and consider pharmacists' workflow when designing eMMS to increase satisfaction, perceived work efficiency and medication safety.

Keywords

Electronic medication management system; hospital pharmacists; qualitative study.

1 INTRODUCTION

The medication management process is complex and involves many different health professionals as well as the patient. Traditional paper medication charts are being replaced by electronic medication management systems (eMMS) that have been shown to reduce medication errors and adverse events [1-3]. However, studies have also found that these systems have major impact on health professionals' workflow [4, 5] and might lead to patient harm [6]. For example, Han and colleagues reported a significant increase in mortality rate due to delays in ordering of therapies and diagnostic testing [6]. The aim of the study was to explore Australian hospital pharmacists' expectations of, or experiences with eMMS, with a particular focus on how these systems will, or have had, an impact on work practices and care delivery.

2 METHODS

2.1 Recruitment

The Society of Hospital Pharmacists of Australia (SHPA) is a professional organization with over 3000 members. Information about the study was distributed via SHPA to all its members in a newsletter, on their Facebook page, Google+ and LinkedIn. Pharmacists interested in participating in the study were asked to contact the researchers directly. Everyone who responded to the invitation subsequently agreed to participate in the study and provided verbal consent before an interview was conducted.

This study was approved (2014-7-19) by the Medical and Community Human Research Ethics Advisory Panel at the University of New South Wales.

2.2 Development of interview guide

An interview guide was developed based on a literature search and consultations with a number of pharmacists working at one of the first hospitals to implement an eMMS in Australia. Two interviews with two pharmacists were conducted to pilot the semi-structured interview guide. The final list of interview questions appears in Table 1.

1. Which, if any, eMMS do you use? When was it implemented?
2. Tell me about the training you received when the eMMS was first introduced.
3. In what ways has/do you think the introduction has impacted/will impact on your work?
4. What are/do you think will be the major benefits with the eMMS?
5. What are/do you think will be drawbacks with the eMMS
6. How does eMMS compare to paper medication records in terms of quality of care and patient safety?

Table 1 Semi-structured interview guide

2.3 Data collection and analysis

All participants were interviewed over the phone by one researcher (ECL) in 2014. All interviews were digitally recorded, transcribed professionally and checked for accuracy by one researcher (ECL). Initial analysis was undertaken alongside data collection independently by two researchers (ECL, MTB, both trained in qualitative research methods) to identify emerging themes that needed to be further explored in subsequent interviews. The two researchers developed a coding scheme, applied it to a sample of transcripts to refine it before the coding scheme was applied to all transcripts. The researchers met regularly to discuss the coding progress and to ensure coding consistency.

3 RESULTS

A total of 18 pharmacists (three males and 15 females) from six Australian States and Territories were interviewed between June and October 2014. Interviews lasted on average 23 min (range 15 min (non-user) to 31 min (user)). Fourteen pharmacists had experience using one or more eMMS including CSC MedChart, Cerner, EPAS (Enterprise Patient Administration System), CHARM™, and MetaVision. Paper medication charts had been replaced by closed-loop systems for prescribing, administration and pharmacy review within the hospital. These systems are not linked to primary care services or community pharmacies. The decision support in the different systems varied. Examples of quotes are presented in Table 2.

3.1 Anticipated impact of eMMS on time and safety among non-users

Six pharmacists were working in hospitals that had not implemented an eMMS yet. Two pharmacists had previously worked in different hospitals thus had eMMS experience, but the other four pharmacists had no practical eMMS experience.

When asked to describe an eMMS, a common explanation was an electronic system that would replace paper medication charts and case notes, facilitate communication between different professions, and be a 'smart' system with alerts that would improve medication safety. The pharmacists were hoping that the eMMS would not negatively impact their workflow and thinking processes but rather facilitate their work and improve efficiency (for example, by not having to search for charts). Pharmacists were currently annotating medication charts and writing in notes but knew that this information was sometimes overlooked. There was an expectation that the eMMS would make this information more visible to others and alert prescribers and nurses to important medication-related information, for example, that therapeutic drug monitoring was needed before the next dose or that a particular medication should be given half an hour before food.

The ability to access electronic records and medication information from the pharmacy was seen as beneficial as long as it did not completely substitute face-to-face interactions. Reduced interaction between pharmacists and patients, nurses and prescribers was believed to be detrimental to patient care. Other benefits included improved legibility, notes documented in a more structured way, and the ability to easily extract and analyze data from the electronic system.

3.2 Users' perceived impact of eMMS on work efficiency

Twelve pharmacists currently using an eMMS reported both negative and positive impact of the eMMS on work efficiency. Positives included the ability to review a patient chart from anywhere in the hospital rather than having to physically locate the chart on the wards, and having all the relevant information stored in one place. Despite the potential to review a patient's chart remotely, almost all pharmacists stated a preference for reviewing the charts on the wards in order to maintain a presence on the wards and ensure high visibility of pharmacists, as well as to talk to other healthcare professionals and patients.

Pharmacists working in hospitals where the eMMS had been integrated with other digital systems reported added benefits including being able to review pathology results at the same time as reviewing medication charts. A number of eMMS were also linked to the pharmacy's dispensing program and this was perceived to facilitate faster dispensing.

Pharmacists with self-reported limited computer literacy, those who were still adjusting to the eMMS, and those using what they perceived to be a poorly designed eMMS reported that the eMMS had had a negative impact on their work efficiency. For example, medication lists displayed in a confusing manner (alphabetically regardless of current or ceased medications; different lists for regular medications, as needed medications, stat medications, and ceased medications) were perceived to slow work down. Some of the drawbacks with eMMS that Australian pharmacists reported were believed to be a result of implementing a system designed in the US without sufficiently tailoring the system to the Australian environment. Frequent tasks, such as documenting a medication history and reconciling a medication list, were perceived to take much longer in the eMMS than on paper charts.

3.3 Perceived impact of eMMS on patient safety

Pharmacists who were working with what they perceived to be well-designed and well-integrated eMMS reported numerous other safety benefits including a reduction in prescribing errors if a protocol, pathway or quick list was used. For example, patients receiving chemotherapy often have a suite of medications (combinations of chemotherapy and medications to ease side-effects for example antiemetics). Using pre-written order sets that included all these medications were perceived to improve safety as well as speed up the review process for pharmacists. Pharmacists could easily see when an order set had been prescribed, if it had been modified, and if so, how. Other safety benefits associated with eMMS included improved visibility and accountability. All medication orders and administrations had legible signatures making it easier to see who had ordered what, who had administered the medication, and at what time.

Some pharmacists mentioned that the eMMS had resulted in new types of errors, but there were inconsistent views about the severity of these new errors. For example, a new

error included using another prescriber's login to access the eMMS but this was perceived as less serious than the errors the eMMS had prevented, thus making it a safer option than paper charts. In contrast, other pharmacists believed that the new errors created by the eMMS were severe, would not have occurred when using paper charts, and therefore placed patients at unnecessary risk of medication errors. For example, one of the eMMS had an in-built 'safety measure' preventing prescribers from ordering warfarin for more than one dose at a time. This restriction had been put in place so that prescribers would monitor INR (international normalised ratio). In reality, this led to prescribers sometimes forgetting to order the daily warfarin dose, placing patients at risk of a serious adverse event. Another new type of error occurred in one eMMS which defaulted all medication orders to STAT (immediate) orders. This resulted in medication orders intended for regular use being ceased after the first dose had been given.

Pharmacists also described design features that did not align well with their work processes and as a result potentially impacted on safety. In one system, some medications had pre-populated directions (e.g. must be swallowed whole) and making changes to these directions had an unintended consequence. On paper charts, pharmacists could easily annotate this order (e.g. ok to dissolve a tablet, must not be crushed or chewed) but annotating a medication order in the eMMS resulted in a duplicate order. This was perceived as confusing and potentially dangerous.

Regardless of the eMM system, having a hybrid system in place (i.e. a combination of eMMS and paper charts) was considered to be a safety risk, minimising the benefits of eMMS. For example, pharmacists were not able to utilize the electronic drug-drug interaction check if some medications were prescribed on paper charts.

3.4 New or different work tasks following eMMS implementation identified by users

Pharmacists reported that recording a medication history was much easier to do on paper than in the eMMS. Some eMMS require the pharmacist to enter all information (medication name, strength, dose, etc) about one medication before moving on to the next medication. This way of documenting the information does not align well with how work is done because patients often first mention all the names of their medications, then how often they take them, and their strengths. Therefore, instead of wheeling in a computer-on-wheels to the patient's bedside (which was cumbersome, and involved asking patients to stop talking while documenting the relevant information) pharmacists would note down the information on paper and transcribe it into the eMMS at a later stage. This was time consuming and increased the risk of transcribing errors.

Another example of a changed task described by participants was requesting changes to orders. With a paper system in place, when pharmacists identified a component of the medication order that needed to be changed, they would take the paper chart to the prescriber and ask them to change the order. With eMMS, pharmacists had to locate the prescriber, ask them to go to a computer, log on and change the order. Pharmacists believed that this was inefficient and more disruptive for prescribers.

4 DISCUSSION

This study showed that some of the expectations pharmacists had before using an eMMS were realized following implementation, but the level of satisfaction with the eMMS was heavily dependent on how the eMMS is designed and how well it was perceived to support pharmacists in their work.

Pharmacists gave several examples of how the eMMS did not support their work, for example by creating duplicate orders when annotating a medication order. Workarounds, a temporary fix without resolving the problem, are common if a system does not support routine work [7] and may result in unintended safety threats such as delayed access to, or difficulty finding, clinically relevant information [8].

Some pharmacists reported that the eMMS was poorly designed and the result was that it took longer to document a medication history and reconcile a medication list. Previous research has shown that users' perceptions of time spent on different tasks may not reflect how they actually distribute their time [9]. We have therefore measured the impact of eMMS on pharmacists' work processes in a direct observational study and found that pharmacists indeed spend significantly more time on medication reviews and history taking post eMMS implementation [10]. However, it may not be that the processes take longer but rather that other tasks, such as supplying medications, are significantly reduced post eMMS implementation, and that this 'saved' time is allocated to important clinical tasks such as history taking and medication review.

Pharmacists in this study identified new errors post eMMS implementation, some of which were considered more serious than the errors the system prevented. The emergence of new types of errors post eMMS implementation is a well-known phenomenon [11-13]. Some of the new errors identified by pharmacists could be eliminated with system redesign. It is therefore important that commercially acquired eMMS are modified to local practices as the same system can produce different outcomes depending on where and how it is implemented [14, 15].

5 CONCLUSION

Electronic medication management systems affect pharmacists' work significantly. Managing expectations and involving pharmacists early in the process of choosing or designing an eMMS, may lead to greater acceptance of and satisfaction with the system. Incorporating safety features that disrupt routine workflows should be closely monitored to reduce the likelihood of unintended consequences.

6 REFERENCES

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7 ACKNOWLEDGEMENT

8 APPENDIX

Themes	Quotes
Anticipated impact of eMMS time and safety	If there's legible writing we won't have to chase doctors around saying, "Oh, hey. What have you written there?" (#13, Male, non-user/previous eMMS user)
	If we've got easy access to their charts online I think that might be beneficial and advantageous (#14, Female, non-user)
	I guess being able to access the patient, the medication charts and their history and everything from the dispensary [would be time saving] whereas at the moment we've got a bit of a process for instance on discharge reconciliations (#8, Female, non-user)
Perceived impact of eMMS on work efficiency	We were able to link the [eMMS] software to our inpatient dispensing software… So the system knows whether the medication that's been prescribed for the patient is – whether it's kept on imprest or whether we need to get it from Pharmacy…So I suppose there's a time-saver there in that you don't have to go and photocopy the chart and then take the chart to Pharmacy and then put it back into the system and dispense it.)#5, Female, user)
	We also have our hospitals networked in the Northern Territory so any patient who comes into the hospital system, the public hospital system, we can view any of the medication history or any admissions across the whole Territory (#10, Female, user)
	If you wanted to write a medication history on a patient, on the paper chart you just write it. Whereas on the system you have to enter each drug and it's a lot slower… I can only type so fast (#Pilot 1, Female, user)
Perceived impact of eMMS on patient safety	Lots of incidents. What concerns me is Warfarin and insulin are very tricky, particularly Warfarin. I've seen a number of missed doses and I'm hearing that from all the pharmacists (#7, Female, user)
	Some of the errors that have happened with medication management that might not have happened in the paper system… And the ones I'm thinking of specifically are I've had three patients where Warfarin doses have been missed because the system is confusing the way Warfarin's ordered. So that's not been good. (#9, Female, user)
	There's a lot of safety features built in. And other things that are meant to be safety features on a paper chart that are automatically done on [eMMS], so like intermittent meds, like it only lets it be due every three days or every two days, if that's how it's charted, you don't have to just rely on someone drawing boxes or figuring it out. (#Pilot 1, Female, user)
New or different work tasks following eMMS implementation	If you don't have access to a terminal, I mean, you're still, essentially, writing it down and then having to transcribe it into the system later. (#13, Male, non-user/previous eMMS user)

Table 2 Quotes from interviews to support different themes