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Nurses' Medication Administration Workarounds when Using Electronic Systems: An Analysis of Safety Incident Reports

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Abstract. Electronic medication management systems (EMMS) have been implemented in most acute care settings in Australia to reduce medication error rates. One of the key challenges related to the introduction of EMMS in hospitals is the uptake of informal "workarounds" by clinicians, including nurses. In this study, we aimed to examine one workaround in depth, nurses not documenting medication administration in the EMMS at the time of administration. We conducted a review of incident reports to identify the factors that contribute to this workaround occurring and the consequences or potential consequences of this workaround on patients. We identified a range of contributing factors, with factors relating to the user (e.g. nurses being time poor) occurring most frequently in incident reports. The most frequently seen consequence of this workaround was the patient receiving an additional dose. This research revealed that strategies to reduce the uptake of this workaround should consider user and organisational factors rather than just EMMS design alone.

Keywords. workaround, nurse, electronic medication management systems, incident reports

1. Introduction

Electronic medication management systems (EMMS) have been implemented in most acute care settings in Australia and have been shown to reduce medication error rates [1]. Despite this benefit, implementation of EMMS is also associated with new errors, challenges and safety risks [2]. A key challenge following the introduction of EMMS in hospitals is the uptake of informal workarounds by clinicians [3]. *Workarounds* are behaviours intentionally performed to counteract perceived barriers to a person achieving a particular objective [4]. Adoption of workarounds is common in hospitals when clinicians recognise a mismatch between the requirements of the EMMS and their clinical workflow [5].

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Nurses play a critical role in medication safety and are viewed as the *last line of defence*, as they are the last clinician with an opportunity to detect a medication error before the error reaches the patient [6]. Previous studies have identified a range of EMMS-related nurse workarounds, such as nurses not taking the computer to the patients' bedside to confirm the medication details prior to administration [7], and nurses not documenting medication administration in the EMMS at the time of administration [3]. The bulk of this research has been qualitative, and limited research has explored the factors that contribute to workarounds and the impact of workarounds on patients, as evidenced in safety incident reports. The current study aimed to fill this gap by determining the reported factors that contribute to a particular workaround; nurses not documenting medication administration in the EMMS at the time of administration, and the potential or actual consequences of this workaround to patients.

2. Methods

2.1. Study Design

Patient safety incidents reported by staff to the NSW Health Incident Information Management System (IIMS) between 1 January 2010 and 31 December 2019 at three hospitals in a Local Health District in Sydney, Australia, were extracted, de-identified and retrospectively reviewed.

2.2. Inclusion Criteria

We defined a workaround as a deliberate act by a nurse to bypass or overcome a perceived workflow block to achieve a particular objective, resulting in medication administration documentation not occurring at the time of actual medication administration. However, during data collection, we ascertained that incident descriptions did not provide sufficient detail to determine whether the nurse's reason for deviating from best practice was to bypass a barrier. As a result, we revised our workaround definition to include all cases that described a deliberate act by a nurse and resulted in medication administration documentation misaligning with actual medication administration (i.e., a violation).

2.3. Data Collection

To identify EMMS-related incidents, incident reports were extracted in January 2021 from IIMS using a free-text keyword search of terms related to EMMS (e.g., EMMS, computer, glitch etc.), resulting in 3,440 incident reports for review. A minimum of two reviewers screened each incident report independently to determine whether it described our specific nurse workaround, with all discrepancies discussed until a consensus was reached.

2.4. Data Analysis

A minimum of two researchers then independently classified each incident report, with the following information extracted and classified:

- The factors that contributed to the workaround, using Kinlay et al.'s [8] classification (see Table 1).
- The potential or actual consequence of the workaround: this was classified as 1) extra dose, 2) missed dose or 3) other.
- Whether or not the consequence reached patient: this was classified as 1) reached patient or 2) near miss.

3. Results

3.1. Factors that Contributed to the Workaround

In total, 109 incident reports were identified and analysed. Incident reports described between zero and four contributory factors. Incident reports most frequently described factors related to the user (n = 72), followed by factors related to the organisation (n = 25) and the EMMS design (n = 13). There were 13 different types of contributory factors described in incident reports, with the most frequent being 'communication breakdown external to the EMMS' (n = 37) (Table 1).

Table 1. EMMS design, user and organisational factors contributing to nurses' workarounds, as reported in incident reports.

Contributory factors	Number of incident reports with this factor reported*
EMMS design	**Total: 13**
Additional tasks required	5
Current configuration does not support work, is complex or is inflexible	5
Error in the EMMS	2
Failure of EMMS to enforce policy	1
User conditions	**Total: 72**
Communication breakdown external to EMMS	37
Time poor or stressed	17
Interruption or distraction	9
Misunderstanding or unfamiliarity with EMMS or workflow	5
Unsafe acts by other users	3
Infrastructure not used as intended	1
Organisation conditions	**Total: 25**
Inadequate training or education	18
System or infrastructure unavailable	6
Downtime	1

* Incident reports could include more than one factor

3.2. The Consequences of Nursing Workarounds on Patients

The most frequently reported potential or actual consequence of these workarounds to patients was the administration of an extra dose (n=86), followed by a missed dose (n=14) and other consequences (n=9). Of the incidents reported, the majority of

consequences reached the patient (n=77, 70%). We identified 30 near misses and in two cases, it was unclear whether the consequence reached the patient.

4. Discussion

Our analysis of incident reports highlighted several factors that contribute to nurses failing to document medication administration at the time of administration, factors related to the user being the most frequent. The most frequently observed consequence of this workaround was the patient being administered an additional dose of their medication.

Communication breakdown external to the EMMS (e.g., poor handover) was a key contributor to incidents in our sample. This finding is consistent with previous research demonstrating poor communication as a contributor to medication errors [9] and highlights that the introduction of EMMS does not lessen the need for good communication between healthcare providers. Another frequently reported user-related factor in incident reports was clinicians being time-poor or stressed. For example, shortages in staff resulted in nurses' not immediately documenting a medication administration in order to save time. This finding is in line with previous research [6] which found associations between a higher patient-nurse ratio and increased uptake of workarounds. Although classified as a user condition, time pressures experienced by nurses are likely the result of a lack of human resources [10].

Inadequate training or education was the most common latent condition related to the organisation described in incident reports. A previous study showed that nurses who did not receive sufficient training on appropriate documentation in the EMMS completed medication documentation later, rather than immediately following medication administration [5]. As inadequate training or education was shown to contribute to reported incidents in our research, gaps may still exist in nurses' awareness of the requirement to document medication administration in the EMMS at the time of administration or the potential risks associated with working around this practice. Providing further education in these areas could minimise medication administration workarounds in the future. These findings highlight that the uptake of this workaround may result from complex interactions between different environmental, organisational, workload, training, and policy impacts that influence the user's behaviour [3].

The most frequent consequence of workarounds observed in incident reports was the administration of an extra dose to patients. Double doses can have a range of consequences to the patient and are of particular concern when medications have a narrow therapeutic index (NTI), where small changes in doses may cause severe adverse effects. Most reported incidents described workarounds that actually reached the patient (i.e., not near-misses), but this likely reflects the voluntary nature of incident reporting [11], and a clinician's tendency to report incidents that had a direct and real impact on patient safety.

This study had some limitations. Incident reporting systems suffer from significant under-reporting and should not be used to quantify a particular issue or risk. It also proved difficult to distinguish between workarounds and violations due to the lack of detailed information reported in incident descriptions. To overcome this limitation, we suggest future studies employ a combination of methods to develop a more in-depth understanding of workarounds in medication administration documentation (e.g., incident analysis, with real-time observations of administrations and nurse interviews).

5. Conclusion

This research is one of the first of its kind to use incident reports to examine specific workarounds related to incorrect medication administration documentation, and the consequences of these workarounds to patients. Importantly, this work revealed that strategies to minimise the occurrence of this workaround should not be directed to EMMS redesign alone but should target user and organisational factors that prevent nurses from using the EMMS as intended.

References

[1] Nuckols TK, Smith-Spangler C, Morton SC, Asch SM, Patel VM, Anderson LJ, et al. The effectiveness of computerized order entry at reducing preventable adverse drug events and medication errors in hospital settings: a systematic review and meta-analysis. Syst Rev. 2014;3:56.

[2] Korb-Savoldelli V, Boussadi A, Durieux P, Sabatier B. Prevalence of computerized physician order entry systems-related medication prescription errors: a systematic review. Int J Med Inform. 2018;111:112-22.

[3] Debono D, Taylor N, Lipworth W, Greenfield D, Travaglia J, Black D, et al. Applying the theoretical domains framework to identify barriers and targeted interventions to enhance nurses' use of electronic medication management systems in two Australian hospitals. Implement Sci. 2017;12(1):42.

[4] Debono DS, Greenfield D, Travaglia JF, Long JC, Black D, Johnson J, et al. Nurses' workarounds in acute healthcare settings: a scoping review. BMC Health Serv Res. 2013;13:1-16.

[5] Lee S, Lee MS. Nurses' electronic medical record workarounds in a tertiary teaching hospital. Comput Inform Nurs. 2021;39(7):367-74.

[6] van der Veen W, Taxis K, Wouters H, Vermeulen H, Bates DW, van den Bemt P. Factors associated with workarounds in barcode-assisted medication administration in hospitals. J Clin Nurs. 2020;29(13-14):2239-50.

[7] Debono D, Clay-Williams R, Taylor N, Greenfield D, Black D, Braithwaite J. Using workarounds to examine characteristics of resilience in action. In: Delivering resilient health care. Routledge; 2018. p.44-55.

[8] Kinlay M, Yi Zheng W, Burke R, Juraskova I, Ho LMR, Turton H, et al. Stakeholder perspectives of system-related errors: types, contributing factors, and consequences. Int J Med Inform. 2022;165:104821.

[9] Hammoudi BM, Ismaile S, Abu Yahya O. Factors associated with medication administration errors and why nurses fail to report them. Scand J Caring Sci. 2018;32(3):1038-46.

[10] Tucker AL. The impact of workaround difficulty on frontline employees' response to operational failures: a laboratory experiment on medication administration. Manage Sci. 2016;62(4):1124-44.

[11] Flynn EA, Barker KN, Pepper GA, Bates DW, Mikeal RL. Comparison of methods for detecting medication errors in 36 hospitals and skilled-nursing facilities. Am J Health Syst Pharm. 2002;59(5):436-46.