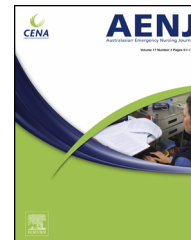




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RESEARCH PAPER

A 'time and motion' evaluation of automated dispensing machines in the emergency department



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KEYWORDS

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Pharmaceutical preparations;
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Summary

Background: There has been limited assessment of the impact that automated medication dispensing machines have on the medication administration process, particularly in Australian emergency departments. The aim of this study is to examine the change in medication retrieval times, number of medications retrieved and staff perceptions before and after the installation of automated dispensing machines in an Australian emergency and trauma centre.

Methods: A time and motion method recorded the time taken and number of medications retrieved from the medication room by emergency department staff, before and after the installation of two automated dispensing machines. Surveys were administered to staff members to elicit the perceived impact on clinical practice, utilising 5-point Likert scales.

Results: A total of 954 medication retrievals (1030 medications) were recorded in the pre-implementation period and 842 (991 medications) in the post-implementation period. The mean time taken to retrieve any medication was significantly longer in the post-implementation period (+5.7 s; $p < 0.01$). For schedules 2, 3, 4 or unscheduled medications, the mean time increased by 26.9 s ($p < 0.01$), but decreased by 36.1 s ($p < 0.01$) for schedule 8 or 11 medications. The mean number of medications per retrieval increased slightly in the post implementation

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period (+0.10; $p < 0.01$). Staff perceptions were that automated dispensing machines improve knowledge of medications on imprest ($p = 0.03$) and reduced medication retrieval time ($p < 0.01$). *Conclusions:* This study found that the medication retrieval process was slower with automated dispensing machines for Schedules 2, 3, 4 and unscheduled medications, but quicker for Schedule 8 and 11 medications in an Australian emergency and trauma centre. Although retrieving medications took slightly longer overall, staff believed automated dispensing machines save time. © 2016 College of Emergency Nursing Australasia Ltd. Published by Elsevier Ltd. All rights reserved.

What is known

- Automated dispensing machines (ADM) securely store medications, restrict access, and enable accurate recording and tracking of medication usage in clinical environments.
- ADMs have been integrated with electronic prescribing systems as part of standard practice in the majority of hospitals in North America.
- In this setting, reported benefits include a reduction in nursing time spent retrieving and administering medications.
- ADMs are relatively uncommon in Australian hospitals and benefits reported in North America may not be applicable given few Australian hospitals have electronic medication management systems.

What this paper adds?

- This study quantifies the impact of ADMs in an Australian emergency and trauma centre without an electronic prescribing system.
- The average time to retrieve schedule 8 or 11 medications decreased with ADMs, but increased for schedules 2–4 or unscheduled medications and overall.
- The average number of medications per retrieval increased slightly with ADMs for schedules 2–4 or unscheduled medications and overall.
- Staff perceptions were that ADMs improve knowledge of medications on imprest and reduced medication retrieval time.

Introduction

Automated dispensing machines (ADM) have been implemented in many hospital settings in an effort to improve the safe and efficient retrieval of medications in clinical environments.¹ Medications stored within ADMs enable both accurate recording and tracking of medication usage and staff access. Systems such as the Care Fusion Pyxis Med Station® store medications within a secure computerised cabinet and restrict access with individual fingerprint login. This system has been shown to be successful in

reducing stock holding, misappropriation of medication and improving financial reporting.^{1–3} The technology also has the potential to identify, prevent and solve many drug-related problems with the information recorded.²

In North America, ADMs are common and have been integrated with electronic prescribing systems as part of standard practice in the majority of hospitals. Literature has been published over the past 20 years evaluating the benefits in this environment. Positive clinical outcomes include a reduction in the nursing time spent administering medications^{3,4} a reduction in the rate of medication errors⁵ and a large reduction in missed medication doses.^{3–6} Despite these benefits, ADMs are still relatively uncommon within Australian hospitals and any benefits seen in North America may not be applicable due to the differences between health care systems,⁷ particularly given relatively few hospitals have electronic medication management systems.⁸ The only Australian study focused on pharmacy specific outcomes including pharmacist workload and prescription turn-around time associated with ADMs.¹

The aim of this study was to assess the impact of ADMs on the medication administration process within an Australian emergency department (ED) setting without an electronic medication management system. Specifically, (i) to quantify the difference in the time taken to retrieve medications before and after implementation, (ii) to quantify the difference in the number of medications retrieved per medication room visit, and (iii) to assess the perceived impact on clinical practice by emergency staff members.

It is hypothesised that retrieval time for less restricted Schedule 2 (S2), Schedule 3 (S3), Schedule 4 (S4) and unscheduled medications will increase as they are relocated from an open shelf to a locked cabinet, and retrieval time for Schedule 8 (S8) and Schedule 11 (S11) medications will decrease with the elimination of manual record keeping and large volume stock counts.

Methods

Research ethics statement

This paper reports the findings of a research study that adhered to the National Statement on the Conduct of Human Research by the Australian National Health and Medical Research Council, and has been approved by the Alfred Health Human Research Ethics Committee (project number 220/12).

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