The road to safer dispensing: Evaluation of dispensary final check of dispensed medicines in a hospital dispensary

Jamie Alivio[1], Stephanie Wai Khuan Teoh[2], Nabeelah Mukadam[2]
[1]School of Pharmacy, Curtin University of Technology, Perth, Western Australia, 6102, Australia
[2]Pharmacy Department, King Edward Memorial Hospital, Perth, Western Australia, 6008, Australia

Abstract

Aims: This study aims to evaluate dispensing errors identified in final check of dispensed medications recorded and identify potential trend over a twelve-month period, to compare the common type and prevalence of the near miss involved in the dispensing error and to obtain institution specific error for future staff education.

Methods: Research Electronic Data Capture (REDCap) database was used to collect errors identified in the final check of dispensed medicines daily in the study hospital. Over a 12-month period between January 2023 and December 2023, dispensary staff recorded errors in an online form on the database.

Results: A total of 98 entries were recorded in REDCap database over the 12-month period, which included 106 errors. During this time, 38,781 medications were dispensed through i.Pharmacy dispensing system. The cumulative rate of dispensing error in 2023 was 0.27%. The highest rates of dispensing errors were recorded in August and October 2023. Over 3,400 items were dispensed in each month, which is comparatively higher than other months. Four errors contributed to 66.04% of all errors identified: incorrect instructions (n=27, 25.47%), other (n=16, 15.09%), incorrect quantity dispensed (n=15, 14.15%) and incorrect quantity packed (n=12, 11.32%).

Conclusion: The reporting and learning system enabled the identification and analysis of the type of dispensing errors in the dispensary. The analysis promotes reflective learning to prevent repeating similar dispensing errors. It also enables targeted education for staff members which is valuable in improving medication safety.

Keywords: pharmacy, dispensing, medication error, medication safety

Background

Medicines are the most common treatment used in health care. Although appropriate use of medicines contributes to significant improvements in health, medicines can also be associated with harm if used inappropriately.[1] Inappropriate use of medications can arise from errors made during the request, dispensing and supply of medications.[2] It is estimated that 250,000 hospital admissions in Australia are medication related.[3] Interventions and standard procedures can be put in place to mitigate the risk of harm to patients.[4] Medication safety is at the forefront of a pharmacy department's duties within a hospital.[1] As outlined by the Australian Commission on Safety and Quality and Healthcare, health services have a responsibility of ensuring safe, effective, and patient-centred care, as well as improving the safety and quality of their services.[4]

Corresponding Author:
Stephanie Wai Khuan Teoh
Pharmacy Department
King Edward Memorial Hospital
374 Bagot Road, Subiaco, Perth, Western Australia 6008
Email: Stephanie.Teoh@health.wa.gov.au
ORCID ID: 0000-0003-2763-1163

Dispensing errors can cause preventable patient harm such as adverse drug events, hospitalisation, or death.[5] A study from the United Kingdom National Health Service identified that 17% of medication errors occurred during dispensing; while Australian data showed 13.4% of medication incidents were associated with dispensing.[6] Dispensing error rates reported in hospital pharmacies vary across settings and countries, ranging between 0.015% and 33.5%.[7] Common dispensing errors were wrong medicine, wrong strength, wrong quantity, and wrong dosage form.[7] Contributors to dispensing errors identified include poor design of dispensaries and human factors including inadequate staff training and experience, compromised workflow, and lack of support for just culture for reporting errors for reflective learning.[6] To reduce dispensing errors, a performance review of existing procedures can give insight into areas that need to be improved or where new strategies can be implemented.[8] The Pharmaceutical Society of Australia and Pharmaceutical Defence Limited have guidelines to promote safe dispensing procedures.[8-10] These guidelines provide the recommended steps and checklist to safely dispense a medication, including screening the medication order or prescription for indication and appropriateness, selecting the correct medication, ensuring accuracy of the strength, dosing, and quantity, and conveying the prescriber's instructions clearly onto the label.[8-10]

For 20 years the study hospital has been recording the dispensing errors identified during the final check[11] and verification of the dispensed medications. The reporting and learning system enabled the identification and analysis of the type of errors identified in the final checking and verification in the dispensing process. The analysis of such documentation promotes reflective learning to prevent repeating similar dispensing errors. It also enables targeted education for staff members which is valuable in improving medication safety and promotes proactive measures to reduce dispensing errors.

Aims

This retrospective observational study aims to evaluate errors identified in the final check of dispensed medications in a Western Australian (WA) Public Hospital Dispensary over a 12-month period. The results from the study may aid in determining areas where interventions can reduce the number of errors occurring during the dispensing process.

Methods

The study hospital uses i.Pharmacy in medication dispensing, which is a state-wide Pharmacy Management Application used in all WA public hospital pharmacy departments. The use of i.Pharmacy has been aligned with state-wide pharmacy business processes including dispensing, distribution, costing, and stock ordering. *Research Electronic Data Capture* (REDCap) software was used to collect errors identified in the final check of dispensed medicines daily in the WA Public Hospital Dispensary. Over a 12-month period between January 2023 and December 2023, dispensary staff recorded errors in an online form on the REDCap software. Entries were extrapolated onto an Excel spreadsheet for analysis. Human Research Ethics approval was gained from the relevant Quality Improvement Committee (Approval number: GEKO 57953) on 30 April 2025.

Results

A total of 98 entries were recorded in REDCap database over the 12-month period, which included 106 errors. During this time, 38,781 medications were dispensed through i.Pharmacy dispensing system. The cumulative rate of dispensing error in 2023 was 0.27%.

The highest rates of dispensing errors were recorded in August and October 2023. Over 3,400 items were dispensed in each month, which is comparatively higher than other months, as noted in Table 1.

Four types of errors contributed to 66.04% of all errors identified: incorrect instructions (n=27, 25.47%), other (n=16, 15.09%), incorrect quantity dispensed (n=15, 14.15%) and incorrect quantity packed (n=12, 11.32%). The category of 'other' refers to errors involved with annotating scripts, spelling mistakes and Pharmaceutical Benefits Scheme (PBS)12 or charging errors. Each of the other errors contributed to less than 5% of all dispensing errors recorded in 2023, as shown in Table 2.

Table 1. Items dispensed and errors recorded per month in 2023

Month	Items dispensed	Errors	Error Rate
January	2742	4	0.15%
February	2995	7	0.23%
March	3383	0	0.00%
April	3024	3	0.10%
May	3473	1	0.03%
June	3330	2	0.06%
July	3379	11	0.33%
August	3462	16	0.46%
September	3114	9	0.29%
October	3414	26	0.76%
November	3229	11	0.34%
December	3236	8	0.25%

Table 2. Frequency of Errors

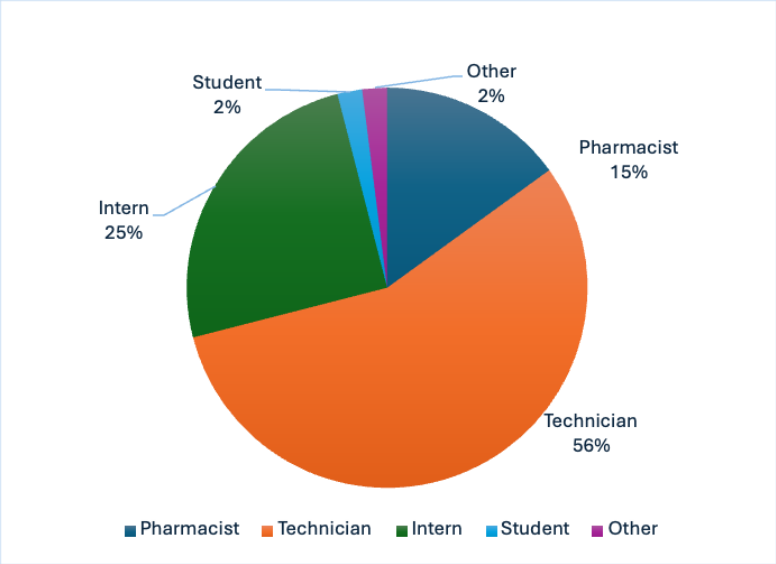
Description of error	Number of records between January 2023 to December 2023
Incorrect instructions	27
Other	16
Incorrect quantity dispensed	15
Incorrect quantity packed	12
Incorrect strength	5
Missing C/A labels	5
Incorrect dosage form	4
Incorrect medication picked	4
Incorrect dispensing type (PBS/Non-PBS)	3
Incorrect charging on invoice	2
Incorrect financial sub-class	2
Incorrect ward	2
Allergies not entered	2
Incorrect medication dispensed	1
Incorrect brand dispensed/picked	1
Missing batch/expiry date (loose tabs, cut strips)	1
Incorrect prescriber	1
Incorrect C/A labels	1
Incomplete entry in S8/S4R register	1
Incomplete paperwork (CMI/leaflets/invoice)	1

Description of error	Number of records between January 2023 to December 2023
Incorrect prescription date	0
No scan-checking	0
Incorrect patient	0

Abbreviations: C/A label, cautionary advisory label; CMI, consumer medicine leaflet; PBS, Pharmaceutical Benefit Scheme; S8/SR, controlled medicines schedule 8 / schedule 4 restricted

Figure 1 demonstrates the distribution of errors made by staff members. A large proportion of errors were made by technicians (n=56, 56%), followed by interns (n=25, 25%) and pharmacists (n=15, 15%).

Figure 1. Distribution of staff responsible for errors



Discussion

The error rate of 0.27% reported in the study hospital is within the range of dispensing error rates previously reported of 0.015% to 33.5%.[7] The wide range of error rates in literatures were thought to be due to differences in operational definitions and error reporting methods used.[5] Therefore it was valuable in this study to compare error rates in the same study site over time to identify unusual trends. When comparing dispensary error type with previous studies, the study hospital had similar common errors including incorrect strength and incorrect quantity.[7] The results on the distribution of errors made by staff members reflect the dispensary workflow, where technicians, interns, and students dispense medication orders, and pharmacists conduct the final check before supplying the medication. Therefore, pharmacists are more likely to observe an error made by a technician. In addition, the lower distribution of errors by interns and students can be attributed to the rotations they take through the hospital's different pharmacy departments. Therefore, interns and students are not always present in the dispensary.

In 2016, a similar audit was conducted to analyse the errors identified within this hospital's dispensary.[8] Since this study, new procedures and technology have been implemented into the dispensary workflow (Table 3).

Table 3. New dispensary procedures implemented after 2016

Procedure	Year implemented
Barcode Scanning *Barcode scanners were implemented to check if the product picked matched the product that was ordered.*	2017
Pharmacist screening of prescription prior to dispensing – prior to 2021 the prescriptions may be received by the pharmacy technicians from the patients and started dispensing without prior screening by the pharmacist. *Scripts and orders are screened by pharmacists for:* • *Safety and appropriateness of medication* • *Errors with prescribing*	2021
i.Pharmacy 'sigs' reviewed and updated. *Sigs which are abbreviated codes used in the dispensary for commonly used instructions on how to take medications.*	2021

Comparing the results with a previous audit conducted at the same hospital in 2016,[11] it is apparent that the rate of dispensing errors has reduced from 0.91% in 2014/15 to 0.27% in 2023. The new technology and procedures implemented into this hospital's dispensing process may have contributed to this change. Dispensing medication is a methodical process and requires risk assessment, clinical assessment, and proper documentation to ensure minimal risk of medication error and harm to patients.

Barcode scanning is an integral part of selecting and preparing the medicine.[9] As outlined in the Pharmaceutical Society of Australia Dispensing Guidelines, barcode scanners are recommended to reduce the frequency of incorrectly dispensed medication, picked medication, and incorrect labelling of a product.[9] These outcomes are apparent when comparing with previous reported study,[7] the dispensing error data of the study conducted in 2016,[11] and the most recent data from 2023. Incorrect medication dispensed was reported as one of the most common dispensing errors in

previous study.[7] Out of the total errors recorded, the frequency of wrong medication picked reduced from 10.2% to 3.77%. This result is consistent with the literature supporting the use of technology results in reductions in dispensing error rates.[6]

Pharmacist screening helps to separate the preliminary checking steps of dispensing from the processing and preparation of medication orders.[9] Distinguishing these steps ensures that the following information is acknowledged for each medication order:

- legal issues with scripts
- inappropriate quantities or repeats/refills prescribed for medications
- inappropriate indication or dose of medications
- clarify what the prescriber has written

If a medication order needs to be amended by a prescriber, pharmacists are responsible for communicating with them to organise a change.[5] This ensures that errors in a medication order are not retained through the preparation and supply of a medication.[9]

The pharmacy department in this hospital utilises the dispensing system i.Pharmacy to process medication orders. Sigs or short abbreviations can be typed in the label-generating space to produce full-sentence instructions. The purpose of sigs is to standardise written instructions to ensure a clear message is given to patients, as well as reduce the amount of time spent dispensing.[9] The frequency of incorrect label instructions occurring when an error is made rose from 24.7% in 2014/15 to 25.5% in 2023.

Limitations

Limitations of the study include the variability that lies within individual pharmacy staff in the documentation of dispensing errors, as well as underreporting of interventions by the staff. Therefore, the data taken from REDCap for this audit may not accurately reflect the nature and frequency of all dispensary errors at this hospital.

Conclusion

The supply of medication within a hospital is a multi-step process that requires a systematic approach to mitigate the risk of errors and patient harm. This study has demonstrated that reviewing and implementing interventions can reduce the number of errors made, therefore improving the safety of the medicine supply within a hospital. The reporting and learning system enabled the identification and analysis of the type of dispensing errors in the dispensary. The analysis promotes reflective learning to prevent repeating similar dispensing errors. It also enables targeted education for staff members which is valuable in improving medication safety. Future analysis of the time of day, number of personnel present, and level of staff experience would allow a more extensive root cause analysis.

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