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Original Research Article

Look-alike, sound-alike medication perioperative incidents in a regional Australian hospital: assessment using a novel medication safety culture assessment tool

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Abstract

Background Medication safety remains a global concern, with governments and organizations striving to mitigate preventable patient harm across healthcare systems. Look-alike, sound-alike medication incidents and the safety culture are widely acknowledged as a contributor to medication errors, particularly within the high-risk perioperative environment. The Medication Safety Culture Indicator Matrix (MedSCIM) is a novel tool developed by the Canadian Institute for Safe Medication Practices to assess the maturity of the medication safety culture. This study aims to delineate look-alike sound-alike (LASA) medication incidents reported in the pharmacy and perioperative settings of an Australian hospital and assess the maturity of the medication safety culture.

Methods The study setting is within a large regional hospital in Australia, servicing both adult and paediatric populations. Medication incidents from 1 April 2018 to 1 April 2023 were retrospectively gathered from the Clinical Incident Management System, Riskman®. Data and statistical analyses were carried out using Microsoft Excel®. The necessary approvals were secured from the Heath Service Human Research and Ethics Committee.

Results During the 5-year period, a total of 246 (4.1%) of the 6002 medication incidents within the health service were identified as meeting the inclusion criteria. Of the 246 medication incidents, 63.0% were identified from the Pharmacy Department, while 22.0% and 15.0% were from the Post Anaesthetic Care Unit and Anaesthetics Department, respectively. The most frequently reported incident classification in both the Anaesthetics Department and Post Anaesthetic Care Unit was 'incorrect dose', followed by 'incorrect medication'. Throughout the 5-year period, 46 (18.7%) of the 246 medication incidents were attributed to look-alike, sound-alike sources of error, predominantly identified in the Pharmacy Department (73.9%), followed by the Anaesthetics Department (17.4%) and the Post Anaesthetic Care Unit (8.7%). High-risk medications were most frequently reported to the Anaesthetics Department. Packaging (packaging alone, naming and packaging, and syringe swaps) was determined to be a contributing factor in 30 (65.2%) of the 46 LASA medication incidents. MedSCIM assessment revealed a reactive medication safety culture. Additionally, the medication incident report documentation was found to be mostly complete or semi-complete.

Conclusion Our analysis delineated medication incidents occurring across the entire medication management cycle and identified incidents related to LASA medications as a contributor to medication incidents across these clinical settings. This novel medication safety culture tool assessment highlighted opportunities for improvement with clinical incident documentation.

Keywords: look-alike; sound-alike (LASA); medication safety culture; hospital; perioperative; medication incidents; pharmacy

Introduction

Medication safety is of concern globally, drawing continuous attention from governments and organizations to curtail preventable patient harm in healthcare. Statistics reveal that medication-related harm affects approximately one out of every 30 patients [1] with half of all avoidable harm in healthcare linked to medications [2]. Healthcare is complex and dynamic, including the delivery of care by multidisciplinary clinician teams and various non-clinical staff. Medication management is complex encompassing numerous organization-wide systems and processes including manufacturing, procurement, deployment/storage, prescribing, dispensing/supply, administration, and monitoring of medications [3]. Each stage involves interactions between cultures, environments, technology, human factors, and behaviours [2], all presenting opportunities for unsafe practices and medication incidents. Such incidents, or errors, are defined as 'any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in control of the healthcare professional, patient or consumer' [4].

Reporting medication incidents within organizations is important for review and analysis to enhance systems and processes, thereby preventing future occurrences [5]. Within any

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institution, the relationship between incident reporting and a culture of safety is important. Voluntary reporting including 'near miss' or 'good catch' incidents that do not result in any patient harm forms the cornerstone of medication safety within hospitals [6]. Analysing trends and patterns within reported medication incidents can reveal opportunities for improvement at various stages of the medication management cycle.

Look-alike, sound-alike (LASA) medications represent a recognized cause of medication incidents, arising from similarities in names or labelling and packaging that may be orthographic (look-alike) or phonetic (sound-alike) [7]. The World Health Organisation's (WHO) recently released a LASA medicines guidelines as part of the Medication Without Harm Global Patient Safety Challenge, which aims to aid policy makers, governments, and healthcare organizations in detecting, addressing, and preventing LASA medication incidents [8]. Characterizing medication incidents across the medication management cycle is important for understanding the impact of LASA incidents, particularly with high-risk medications in high-risk clinical settings like the perioperative environment [7], which are key focus areas to reduce preventable medication related patient harm [9].

Patient safety initiatives within organizations aim to minimize the risk of unnecessary and preventable harm associated with health care [1]. There is a correlation between clinical incident reporting and a culture of safety within an organization. Transition away from an individual focused 'blame and shame' culture to a system-based culture fostering generative solutions enhances patient safety [10]. A safety culture is shaped by a 'product of individual and group values, attitudes, perceptions, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of an organizations health and safety management' [11].

The Medication Safety Culture Indicator Matrix (MedSCIM) is a novel tool developed by the Canadian Institute for Safe Medication Practices (ISMP) to assess medication safety culture [12]. The tool comprises two dimensions that evaluate both completeness of documentation related to each medication incident and the maturity of the medication safety culture, extracted from a Clinical Incident Management System. Evaluating incidents through the MedSCIM matrix classifies the overall maturity of culture on a scale from pathological to generative, focusing on system-based causes rather than individual fault or 'blame and shame' culture [13]. Disseminating learnings from incidents positively at departmental meetings encourages behaviour change and best practice [14].

This study aims to characterize look-alike sound-alike (LASA) medication incidents reported in the pharmacy and perioperative settings of an Australian tertiary referral hospital for analysis, using a novel quantitative assessment tool to gauge the maturity of the medication safety culture.

Method

Clinical incidents classified as 'medication' were extracted from the health service Clinical Incident Management System, Riskman® over a 5-year period (1 April 2018 until 1 April 2023). The Strengthening the Reporting of Observational studies in Epidemiology Statement was utilized to report this study (Supplementary Material Table SM1) [15].

Study setting

This study was conducted in an 800-bed regional tertiary referral hospital, and 12 operating theatres with designated specialities for adult and paediatric populations. Anaesthetic care predominantly involves speciality trained medical officers, with nursing staff providing support. In this study, the perioperative setting is defined as being within the operating theatres (Anaesthetics Department) or the Post Anaesthetics Care Unit (PACU), acknowledging the multidepartment, multidisciplinary nature of perioperative care. Inclusion criteria were the classification of a 'medication' incident occurring in the Pharmacy, or Anaesthetics Departments or the PACU over a 5-year period. The authors included all medication incidents occurring within the Pharmacy Department, not limited to those found within the perioperative setting to determine the frequency of LASA sources of error for a future intervention.

Data collection

Retrospective data retrieval using the Clinical Incident Management System, Riskman® database via Microsoft® Excel over a 5-year timeframe was chosen to ensure an adequate sample size. Data extracted included Severity Assessment Criteria (SAC) rating (indicator of patient harm), and the stage of the medication management cycle involved such as prescribing, supply/dispensing, monitoring, or administration. Medication and dosage form, description of the incident and the investigation outcome was obtained. The data extraction tools that were developed are included in Supplementary Material Table SM2 and SM3.

Data analysis

Data analysis was performed using Microsoft Excel® to filter, sort, and categorize relevant variables, enabling a descriptive examination of patterns and trends within the dataset. Statistical analysis was conducted using Microsoft Excel® to generate descriptive statistics. The dataset was analysed using the MedSCIM tools by the primary author and a randomized sample of 20% of incidents were independently reviewed by a coauthor (K.L.R.) to reduce potential bias. In instances where there was differing classifications of the data, both co-authors (A.N.R., K.L.R.) engaged in discussions to reach a final consensus. If consensus could not be reached through discussion, a third coauthor (B.D.G.) was consulted to make the final determination. The primary author completed training with the Institute of Safe Medication Practices (ISMP)—Canada, to ensure a uniform and consistent approach to the analysis of medication incidents using the MedSCIM tools. Analysis was aligned with the original intentions of the MedSCIM tool, facilitating accurate interpretation of the completeness and maturity.

Ethical considerations

This study was approved by the Health Service Human Research and Ethics Committee and assessed to comply with the National Statement on Ethical Conduct in

Table 1. Distribution of medication incidents and classifications by management process and department

Location	Medication process	Total incidents (n)	Total incident classifications (n)
Anaesthetics Department	Prescribing	8	8
	Preparation/dispensing/supply	5	5
	Administration	21[a]	23
	Monitoring	2	2
	Transfer of information	1	1
Total		**37**	**39**
PACU	Prescribing	6[a]	7
	Preparation/dispensing/supply	2	2
	Administration	43[a]	45
	Monitoring	2	2
	Transfer of information	1	1
Total		**54**	**57**
Pharmacy Department	Prescribing	10[a]	11
	Preparation/dispensing/supply	117[a]	133
	Administration	8[a]	9
	Monitoring	3	3
	Transfer of information	4	4
	Discharge medication management	13[a]	29
		155	**189**
Total (All locations)		**246**	**285**

[a]Denotes classifications with recorded duplicates contained.
One medication incident may have multiple incident classifications.

Table 2. Ranking of medication incident classifications by department and frequency

Ranking of incident classifications	Anaesthetics Department	PACU	Pharmacy Department
1	Incorrect dose	Incorrect dose	Medicine not supplied
2	Incorrect medicine	Administration not recorded/signed Incorrect administration technique	Incorrect medicine
3	Administration not recorded/signed Other prescribing issue Patient reaction to medication	Incorrect time or frequency of administration	Incorrect directions
4	Administered with a known allergy Incorrect storage Other monitoring issue Other preparation/dispensing/supply issue	Omitted dose	Incorrect dose
5		Incorrect medicine	Incorrect strength or concentration

If frequencies were equal for each ranking than all classifications were listed per ranking.
'1' denotes highest frequency.

Human Research 2007 (HRE/2023/QTHS/92 779). Additional research governance approvals were also obtained.

Results

Quantitative analysis of medication incidents

During the 5-year period, a total of 246 (4.1%) of all medication incidents (6002) met the inclusion criteria within the health service. These medication incidents were associated with 285 (3.5%) medication incident classifications (8218) during the period. A single medication incident may have multiple classification types associated with it, for example a single dispensing-based medication incident may have the classification of 'incorrect medicine' and 'medication not supplied', if the incorrect medication was dispensed instead of the intended medication. Table 1 shows the distribution of medication incidents and classifications according to the medication management cycle and study setting. The Pharmacy Department had the largest number of medication incidents representing 155 (63.0%), followed by 54 (22.0%) in PACU and 37 (15.0%) in the Anaesthetics Department (Table 1). The administration stage of the medication management cycle was the most frequently involved within the Anaesthetics Department while medication preparation, dispensing or supply predominated in the Pharmacy Department. Medication incidents were assessed as causing temporary patient harm in 1.2% of the 246 incidents, while no patient deaths or permanent patient harm were reported. The patient outcome for the remaining incidents was either minimal patient harm or no patient harm 60.6%, a 'near miss' situation for 37.0% or 1.2% had an unconfirmed SAC rating.

The top five medication incident classifications for each location are shown in Table 2. A summary table of all medication categorizations is provided in Supplementary Material Table SM4. 'Incorrect dose' was the most frequently reported incident classification for both the Anaesthetics Department and PACU. 'Incorrect medication' was second most frequently reported within the Anaesthetics Department and had a ranking of equal fifth most frequently reported in the PACU. The most frequent classification reported within the Pharmacy Department related to medications not been supplied followed by 'incorrect medicine' and 'incorrect dose' or 'incorrect strength and concentration'.

Quantitative analysis of LASA medication incidents

During the 5-year period, 46 (18.7%) of the 246 medication incidents were identified as related to LASA naming and or labelling and packaging. A comprehensive analysis of LASA medication incidents, including the likely contributing factors, is shown in Tables 3 and 4. All identified LASA medication incidents were analysed within the Pharmacy Department

Table 3. Analysis of medication incidents by location, high risk medication classification, LASA medication incident contributing factors and thematic analysis

Location	Total number medication incidents	Total number of incident classifications by LASA (%)	High risk medication identification (n) and percentage of LASA (%)		LASA medication incident (%) and likely contributing factor (s)			
			ISMP classification[a]	Australian classification[b]	Naming[c]	Naming and packaging[d]	Packaging[e]	Syringe swap[f]
Anaesthetics Department	37 Medication incidents	8 (21.9%) of medication incidents associated with Anaesthetics had an identified LASA root cause	7 (87.5%) of LASA medication incidents associated with Anaesthetics Department met the ISMP definition of a high-risk medication Medication Classes: Adrenergic agents (3 incidents) Anaesthetic agent (2 incidents) Sedating agents (1 incident) Opioid (1 incident)	4 (50.0%) of LASA medication incidents associated with Anaesthetics Department met the Australian definition of a high-risk medication Medication Classes: Anaesthetics (2 incidents) Benzodiazepine (1 incident) Narcotic (1 incident)	Zero medication incident in the Anaesthetics Department was due to naming only	1 (12.5%) of LASA medication incident was due to naming & packaging in the Anaesthetics Department	4 (50.0%) of LASA medication incidents was due to packaging only in the Anaesthetics Department	3 (37.5%) of LASA medication incidents resulted in a syringe swap in the Anaesthetics Department
PACU	54 Medication incidents	4 (7.4%)	1 (25.0%) Medication Class: Adrenergic agent (1)	1 (25.0%) Medication Class: Antimicrobial (1)	1 (25.0%)	0	2 (50.0%)	1 (25.0%)
Pharmacy Department	155 Medication incidents	34 (21.9%)	5 (14.7%) Medication Classes: Adrenergic agent (1) Anticoagulant (1) Chemotherapy (oral) (1) Parenteral Nutrition (2)	5 (14.7%) Medication Classes: Anticoagulant (1) Antimicrobial (1) Benzodiazepine (1) Concentrated Electrolyte (1) Chemotherapy (oral) (1)	15 (44.1%)	6 (17.7%)	13 (38.2%)	0
Total medication incidents across clinical settings	246 (4.1%) of the 6002 medication incidents within the health service during a 55-year period	46 (18.7%) of medication incidents had an identified LASA root cause	13 (28.3%) of LASA medication incidents met the ISMP definition of a high-risk medication	10 (21.7%) of LASA medication incidents met the Australian definition of a high-risk medication	16 (34.8%) of medication incidents were due to naming only	7 (15.2%) of LASA medication incidents were due to naming & packaging	19 (41.3%) of LASA medication incidents were due to packaging only	4 (8.7%) of LASA medication incidents resulted in a syringe swap

Definitions: LASA medication incidents, high risk medication classification and likely causative factor (s) definitions:
[a]ISMP definition of a high-risk medication [16].
[b]Australian Classification of a high-risk medication [17].
[c]Naming only: The LASA nature of the medication naming (drug or brand name) was considered as a contributing factor along with the reporter's description of the medication incident.
[d]Naming and packaging: The similarity of the medication names (drug or brand name) was considered and whether the reporter described the labelling and packaging as being similar or contributing to the incident.
[e]Packaging: The reporter described the labelling and packaging as being similar or contributing to the incident. The medication name was different and not determined to be a contributing factor in the incident.
[f]Syringe Swap: The reporter identified within each medication incident description that a syringe containing the unintended medication was given instead of a syringe containing a different medication.

Table 4. Contributing factor thematic themes [8] within LASA medication incidents by location and frequency of identification (n)[a]

Location		
Anaesthetics Department	**PACU**	**Pharmacy Department**
Administration—Selection of the product according to familiarity of the packaging or strength rather than confirming and double-checking the medicine name and dose (4)	Administration—Selection of a product according to familiarity with the packaging or strength rather than confirming and double-checking the medicine name and the dose (2)	Dispensing—selection of products according to where they are stored in the pharmacy or according to the packaging rather than by name and strength of the product (20)
Administration—Look-Alike Packaging Issue (Non-Manufacturer Packaging)—Syringe Swap (3)	Administration—Unfamiliarity with medicine, leading to the selection of a look-alike product (2)	Dispensing—unfamiliarity with medicines, leading to selection of a look-alike product (14)
Administration—Unfamiliarity with medicine, leading to the selection of a look-alike product (3)	Administration—Look-Alike Packaging Issue (Non-Manufacturer Packaging)—Syringe Swap (1)	Dispensing—barcode scanning of medicine not used (9)
Dispensing- selection of products according to where they are stored in anaesthetic drawer or refrigerator according to packaging rather than the name and the strength of the product (3)		Dispensing—incorrect storage location within an ADC (5)
Dispensing—changing the appearance or packaging of medicines, making them like other products (2)		Dispensing—changing the appearance or packaging of medicines, making them similar to other products (1)
Administration—Failure of the independent double check as a safety strategy (1)		Dispensing—medication order not reviewed for correct charting prior to dispensing (1)
Dispensing—Storage of LASA medicines on the same shelf next to each other, which may be picked up incorrectly during dispensing (1)		Dispensing—changing the appearance or packaging of medicines, making them like other products (1)
Training—Supervision issue with junior staff (1)		

Definitions:.
[a]Based on the reporter's description of the medication incident, there may be a single or multiple LASA contributing factor themes identified for each incident.

and were not limited to medications likely to be prescribed and administered in theatres, PACU or during the practice of Anaesthetics. Medication incidents that involved high-risk medications occurred in approximately a quarter of all the LASA incidents, with most high-risk medication LASA incidents reported in the Anaesthetics Department (Table 3). The highest percentage of LASA incidents were identified in the Pharmacy Department 73.9%, followed by the Anaesthetics Department 17.4% and the PACU 8.7% (Table 3). Packaging emerged as the most likely contributing factor in 41.3% of LASA incidents, followed by medication naming 34.8%, both packaging and naming 15.2% and a syringe swap 8.7%. Packaging (packaging alone, naming and packaging, and syringe swaps) was determined to be a contributing factor in 65.2% of the 46 LASA medication incidents in all clinical settings (Table 3). Table 4 shows the LASA contributing factors across the different clinical settings during different stages of the medication management cycle. Within all clinical settings, the selection of a medication or product according to the packaging or where it is stored within the work area was determined to be the most frequent contributing factor to LASA incidents. Failure to appropriately identify the medication name and strength prior to dispensing or administration and unfamiliarity with the medication was also commonly identified across the departments.

Assessment using the Medication Safety Culture Indicator Matrix

The overall results of the MedSCIM assessment are shown in Table 5, and further detailed analysis by clinical setting is provided in Supplementary Table SM5. Table 5 demonstrates that of the 275 medication incidents assessed, the overall medication safety culture was predominately assessed as being neutral (56.0%), positive (38.6%), and negative (5.5%). Most medication incidents (52.4%) were assessed as being from a reactive culture, with semi-complete reports. The results of the MedSCIM risk assessment core dimensions showed that medication incident reports were either complete (53.8%) or semi-complete (46.2%). Medication incident classifications were assessed as being 'Level 3 – Report Not Complete' (3.6%), meaning that 10 incidents were excluded from further analysis to determine the maturity of the culture. The Pharmacy Department had the highest percentage of reports being assessed as occurring from a Grade A (Generative) Culture that were assessed as Level 1 (Fully Complete) (13.7%), followed by the PACU Unit (7.3%) and the Anaesthetics Department (5.4%). The highest percentage of Grade D (Pathological) reports were assessed in the Anaesthetics Department (21.6%), Pharmacy Department (3.3%), and PACU (1.8%) (Supplementary Material Table 5). There were two areas of improvement identified related to incomplete documentation and the maturity of the medication safety culture. Medication incidents were assessed as being semi-complete if there was no description of contributing factors within the incident description and less mature if they did not identify possible solutions to prevent reoccurrence.

Discussion

Statement of principle findings

This study provides a comprehensive assessment of medication incidents throughout the medication management cycle for high-risk medications, involving LASA medication incidents within the pharmacy and perioperative settings. LASA errors frequently resulted in 'incorrect medicine' incidents,

Table 5. Medication safety culture indicator (MedSCIM) matrix assessment of all medication incident [12, 13]

		Maturity of culture			
		Grade D[a]—Pathological	Grade C[b]—Reactive	Grade B[c]—Calculative	Grade A[d]—Generative
Completeness	Level 1[e]—Report fully complete	3	41	73	31
	Level 2[f]—Report semi-complete	12	103	10	2
	Level 3[g]—Report not complete	0	0	0	0

Definitions [12, 13]:
[a]Grade D: Pathological—The medication incident report focuses on individual human behaviours and fault instead of a systems-based approach.
[b]Grade C: Reactive—The medication incident treats the incident as an isolated event. No solutions are offered to prevent recurrence.
[c]Grade B: Calculative—The medication incident report uses a systems-based approach to describe the root cause. No solutions are offered to prevent future recurrence.
[d]Grade A: Generative—The medication incident report uses a systems-based approach to describe the root cause and develop possible solutions to prevent recurrence.
[e]Level 1: Report Fully Complete—The incident report provides sufficient information to describe the medication incident and contributing factors.
[f]Level 2: Report Semi-Complete—The medication incident report provides sufficient information to describe the medication incident. No information is provided about the contributing factors.
[g]Level 3: Report Not Complete—The medication incident report provides insufficient information to allow meaningful qualitative analysis.
Medication safety culture defined by colours with dark grey as a negative, light grey as neutral, and white as a positive safety culture [12, 13].
10 medication incident classifications were assessed as being 'Level 3 – Report Not Complete'. These incidents were excluded from further analysis to determine the maturity of the culture.

making this the second most common incident classification for the Anaesthetics and Pharmacy departments, and the sixth most common in PACU. LASA medication incidents involving high-risk medications were reported most frequently within the Anaesthetics Department. LASA errors, particularly pertaining to medication naming and labelling, as well as packaging, contributed to 18.7% of the 246 reported medication incidents over the 5-year period. Packaging-related factors, encompassing combinations of naming and packaging, packaging alone and syringe swaps accounted for a majority of 65.2% of the 46 medication incidents. Medication selection based on the packaging or storage location, such as in the anaesthetics trolley or pharmacy and unfamiliarity with the actual medication were the leading contributing factors for LASA medication incidents. Failure to appropriately identify the medication name and strength prior to dispensing or administration was also identified as important contributing factors. These findings underscore the importance of developing tailored risk mitigation strategies to effectively prevent LASA medication incidents. Additionally, analysis utilizing the MedSCIM sheds light on the culture of Medication Safety in these clinical settings, revealing a predominantly 'reactive' culture. Proactive risk management and continuous quality improvement that focuses on improving workforce knowledge where contributing factors are identified may improve medication safety practices within the health service.

Strengths and limitations

A strength of this paper lies in the utilization of medication incident data from a hospital where medication safety is mandated by national accreditation standards. Staff members are actively encouraged to report medication incidents and regular accreditation assessments ensure compliance. First, this research represents the first application of the MedSCIM assessment tool within a hospital pharmacy and perioperative settings to be published in a peer-reviewed journal. However, it is important to acknowledge certain limitations of the study. The retrospective nature of the review did not involve visualization of the actual primary labelling and packaging involved in the incidents, which may have provided additional insights. Additionally, although staff are actively encouraged to report medication incidents through voluntary reporting, the risk of underreporting of actual incidents is a well-recognized limitation.

Interpretation within the context of the wider literature

The findings of this study are consistent with previous studies indicating that administration incidents are common in the perioperative setting, due to the complexity and high-pressure nature of these clinical settings [18]. The administration stage of the medication management cycle was the most frequently reported within both the Anaesthetics Department 56.8%, and PACU 79.6%, while medication preparation, dispensing, or supply predominated in the Pharmacy Department 75.5% (Table 1). The most common incident classifications were 'incorrect dose' and 'incorrect medication, particularly prevalent in the Anaesthetics and PACU departments (Table 2). High-risk medications were involved in approximately a quarter of all the LASA incidents, with most high-risk medication LASA incidents reported in the Anaesthetics Department. Differences in the definition of high-risk medications were demonstrated with meeting the ISMP definition (28.3%) compared with the Australian definition (21.7%) (Table 3). Patient outcomes of LASA medication incidents involving high-risk medications depends on the medication administered, the dose or route of administration and the condition of the patient [19]. Fortunately, only a small percentage of medication incidents (1.2%) were assessed as causing temporary patient harm and no patient deaths or permanent patient harm were reported.

High-risk medications and LASA incidents represent a significant challenge in medication safety [9, 18]. This study found 18.7% of the LASA medication incidents, with the

Pharmacy Department reporting the highest frequency, which were mostly caused by medication naming and packaging. Meyer *et al*. describe in the perioperative setting that similar shaped medication vials and the colour of the labelling and vial cap are important sources of error [20]. The proactive identification of LASA combinations is an ongoing challenge due to new medications coming onto the market, medication shortages, formulary changes and purchasing of alternative brands of medications [20]. Addressing LASA contributing factor themes, such as selection of medications based on familiarity and incomplete checking practices, requires targeted interventions such as enhanced training, process redesign, and the implementation of advanced technologies to reduce incidents associated with human factors. Multifaceted risk LASA risk mitigation strategies specific for the perioperative setting may be effective in preventing patient harm [21]. The ISMP specifically recommends reading the medication vial and never relying on a partially turned label or the colour of label or cap [22]. Anaesthesia trolleys and trays should always be stocked on the side with the label facing upwards rather than in the cap-up position to avoid medication selection based on cap colour [22]. Regulators also have a responsibility to ensure that manufacturers have adequate regulation surrounding products to ensure that they are labelled without ambiguity and that lessons from the past are learnt [14].

The MedSCIM analysis provided insights into the maturity of the medication safety culture within the hospital. Most incidents were associated with a reactive culture, where incident reports often lacked detailed contributing factors and potential solutions. This highlights the need for a shift towards a more generative culture that not only identifies system-based causes of incidents but also proposes actionable solutions to prevent recurrence. Enhancing the completeness and quality of incident reports is crucial for developing a proactive and safety-oriented culture [12, 13]. A generative safety culture is characterized by a commitment to continuous learning and improvement where staff are encouraged to report errors and near misses as opportunities for learning rather than punishment. Implementing regular training programs, feedback sessions, and root cause analysis of incidents can help in fostering such a culture [8, 22]. The Global Patient Safety Report 2024 recognizes that leadership commitment is essential to drive cultural change and ensure that safety practices are integrated into everyday clinical routines [23]. Accurate documentation in every healthcare profession is a professional accountability and completeness of documentation is a fundamental component of patient safety.

Implications for policy, practice, and research

This study contributes to the current understanding of LASA incidents, with a specific focus on the pharmacy and perioperative settings. While the study is context specific to a large regional Australian tertiary referral hospital, its findings have potential for informing practice initiatives and research endeavours in similar settings. By highlighting the importance of well-planned and proactive risk mitigation strategies within medication safety literature, this study provides valuable insights for healthcare facilities seeking to enhance their medication safety policies and procedures. However, further research is warranted to evaluate the effectiveness of these interventions and their impact on clinical outcomes and patient safety.

Conclusion

Our findings have demonstrated that throughout the 5-year period, 18.7% of medication incidents were attributed to LASA sources of error such as naming, labelling, and packaging. A systems-based approach to safety, where a mature and generative medication safety culture is created, is imperative for the identification of contributing factors to medication incidents and subsequent interventions to mitigate future incidents. However, further research is needed to determine if these interventions translate into improved clinical outcomes and minimized patient harm.

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Author contributions

Alexandra N. Ryan (Conceptualization, Literature search, Data extraction, Drafting and manuscript, Critical revision), Kelvin L. Robertson (Drafting and manuscript, Critical revision), Beverley D. Glass (Drafting and manuscript, Critical revision). All authors read and approved the final version.

Supplementary data

Supplementary data is available at *IJQHC* online

Conflicts of Interests

None declared.

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Data availability

Data cannot be shared for ethical/privacy reasons. The data underlying this article cannot be shared publicly due to the Human Research Ethics Committee and research governance conditions. These restrictions are in place to protect patient confidentiality and prevent the potential identification of individuals from the dataset.

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