Medication Error Prevention –
Causative factors and Preventative Strategies

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Introduction

Medication errors feature firmly in New Zealand's national data on Serious and Sentinel events. As part of a wider project promoting Medication Safety and Medication Error Prevention at our hospital, a literature search was conducted to identify the incidence of Medication Errors or near misses in the inpatient setting. This summary outlines some of the causative factors identified including both human and systems factors together with strategies for error prevention and medication vigilance.

Incidence of errors

Bruce (2009) suggests that medication errors constitute as many as 25% of all adverse events. This is hardly surprising as the administration of a single dose of medication requires between 80 and 200 individual steps from prescription and preparation to dispensing and administration (Maharajan, 2011).

The exact rate of error is hard to pinpoint although some writers suggest a range from between 4-14% of all medications administered (Blank et al, 2011). The Joanna Briggs Institute (2010) suggests that up to 10 times more errors are committed than are reported. A well-recognized culture of under-reporting is said to exist in almost all healthcare settings (Mahajan, 2011). Possible reasons for this may be that hospitals fear damage to their reputation and that individuals fear punishment if errors are reported.

Clinicians appear to be reluctant to acknowledge that errors occur and represent a significant problem. Medication errors do however feature in the list of the top ten causes of mortality worldwide (Mahajan, 2011). Despite this, complacency exists, stemming perhaps from the knowledge that many errors are without significant consequence to patients (Merry, 2008). Nevertheless clinicians must do all that they can to minimise the risk.

Categorization of errors

A plethora of literature exists on the causation and prevention of medication errors and near misses. Many writers have analyzed errors in an attempt to isolate individual factors that can be addressed. Thompson (2011) suggests that errors are particularly prevalent at points of transition in patient care such as Admission or Discharge.
One way of categorizing errors is by the Medication involved. Most commonly cited drugs are heparin, insulin, inotropes, sedatives, potassium chloride, magnesium sulphate and antibiotics (Maharajan, 2011).

A further categorization is by the type of error itself. Bruce (2009) suggests that mistakes in drug delivery can usually be categorized as one of three main groups; ‘wrong drug, wrong dose or wrong delivery’. Errors related to the administration of drugs are most frequent (53%), when compared to prescribing errors (17%), preparation (14%) or transcription errors (11%) (Maharajan, 2011). Blank et al (2011) suggest that errors that are made during the administration phase may be as high as 36%.

**Causative Factors**

There is universal agreement in the literature that multiple factors contribute to medication errors. In up to 87% of errors, both human factors and organizational inadequacies have been implicated (Maharajan, 2011). It is useful to itemize both human and systems factors if these factors are to be identified and addressed.

The Joanna Briggs Institute (2009) states “The process for routine medication administration has a number of factors which have been identified as contributing to errors: mathematical skills, knowledge of medications, the quality of the prescription, length of experience, shift patterns, workload and staffing levels, medication delivery systems, single-nurse administration, policies and procedures and distraction and interruptions” (p.19). Maharajan (2011) adds staff shortages, cognitive overload, distraction, poor communication, haste and fatigue to this list. Do any others spring to mind?

Human factors include slips in attention, errors of judgment, lack of knowledge or tiredness and distraction (Bruce, 2009). Several researchers have surveyed nurses to gain their perspective on error causation. Self-report from nurses describes the following factors as having contributed to errors – lack of familiarity with a drug, insufficient training about medications, miscommunication during verbal orders and heavy workload. ‘Sound-alike, look-alike’ medications and failure to recheck are also cited.

Blank et al (2011) warn that the increased complexity and chronicity of health problems in patients today, means that patients often present with multiple medications and a lack of detailed history. This renders them virtual strangers compared to the healthcare setting a few decades ago. A 3 month interventional study of 127 nurses was conducted, including a pre- and post-test of medication safety knowledge and behaviors reflecting recommended medication practice. Together with a chart review and analysis of voluntary error reporting, this study revealed an alarming disparity between the nurse’s knowledge of approved practice and how they actually behaved in the practice setting (Blank et al, 2011).
Frequent use of verbal orders, the wide range of drugs available, time pressures and interruptions are other recurring themes.

**Strategies for error reduction**

*Human and systems*

It’s heartening to see an emerging literature and the evolution of national initiatives that are devoted to the minimization of medication errors. Any strategies to decrease the rate of medication errors must employ multiple approaches that address not only the human but the systems and organizational factors. Ferner (2012) suggests that a single inpatient stay affords patients with multiple interactions in many physical settings with multiple clinicians. Careful and continuous analysis of the system and the patient’s journey through that system will highlight the opportunities that it presents for error, allowing a more robust system to be designed.

*Second checking*

Psychologists distinguish two broad groups of errors: errors of knowledge and planning, or slips and lapses (Ferner, 2012). Errors of knowledge and planning are amenable to education, such as training for new Prescribers, or education on drug interactions for nurses. Slips and lapses are often neglected but demand equal attention. In experimental studies of error, independent (or second) checking detected 90% of errors (Ferner, 2012). Nurses however, often resist the practice of second checking because of constraints of time and a perceived difficulty locating a second nurse. Ward Pharmacists provide an additional buffer between the Prescriber and patient harm.

*Electronic means*

Barcoding and computerised prescribing can eliminate errors of illegibility and incompleteness in prescriptions. While enforcing prescribing rules they may however lead to ‘alert fatigue’ whereby the Prescriber can choose to override warnings of potential drug interactions (Ferner 2012).

*Education*

Simonsen et al. (2011) found medication knowledge to be unsatisfactory among practicing nurses, with a significant risk for medication errors. They suggested a need for an improved focus on staff education and awareness of basic errors. Of concern is a finding from limited studies that suggests that written medication exams and education on clinical calculations do not improve nurse competence to prevent errors beyond the skills that nurses have already accrued (Hodgkinson et al, 2006). Thompson (2011) promotes medication safety education that begins at new staff orientation.

*Human factors*

Minimizing tiredness and avoiding extended working hours present continuous challenges in healthcare. Distraction and interruption are also endemic although various initiatives have been used to create “No interruption zones” (NIZ) with good effect. Large signs posted above medication carts with demarcation of a physical floor space were one approach. Another
approach involved nurses donning bright yellow vests when preparing / dispensing medications. These nurses reported that they could think more clearly and administer medications more efficiently (Kyle, Wiencek, Bauer, Daly and Anthony, 2010). The percentage of interruptions decreased from 31.8% to 18.8% in the study.

**Standardization**
Many approaches involve standardization and the elimination of choice to ensure consistency.

These approaches include –
- standardized protocols and infusion regimes
- use of prefilled syringes wherever possible
- standardized storage including the storage of epidural and intrathecal medications separate to IV meds
- ensuring that ampoules with concentrated solutions are not mixed with others
- standardized packaging and presentation eg segregate ‘look alike’ packaging
- standardized labeling eg color labels for continuous infusions
- minimizing advanced preparation of syringes and infusions wherever possible
- removing unused medications off the shelf
- standardizing medication charts (Thompson 2011)

**Keeping the patient central**
Ferner (2012) suggests that research be conducted on a greater engagement of the patient and family in medical decision-making. This recognizes that the patient is a potential source of medication knowledge and second checking if they are educated about their medications, purpose and risks. This might lead to greater error recognition and harm reduction without any additional cost.

**Vigilant checking**
There exists a danger in conducting seemingly routine tasks, whether it is rewriting a medication chart or calculating a drug dose. Checking should include –
- Allergy status
- The discipline of the ‘five rights rule’ (right medication, dose, time, patient and route)
- Medicines reconciliation and checks for consistent documentation from preoperative history taking to pre-discharge checks
- Diligent prescribing that employs only approved abbreviations

**Quality assurance**
Strategies include –
- Fostering a truly ‘no-blame’ culture where all errors and near misses are reported irrespective of patient harm
- Systematic analysis of errors
Creating a system so that errors can be analyzed, lessons learned and converted to system improvements

Maharajan (2011) suggests three guiding principles that should underscore efforts to reduce of drug errors –
1. Reduce the complexity within the system
2. Standardize and remove redundant items / processes
3. Double check ampoules, syringes and doses

Summary
The literature on medication error prevention would suggest that the task is continuous, requiring mature dialogue, regular review of errors and analysis of causative factors together with professional leadership to integrate this knowledge into systems improvements.

References


