

## Medication Errors: Medication Orders with Error-Prone Abbreviations

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### Abstract

**Introduction:** Ambiguous abbreviations are one the most common and preventable causes of medication errors. Clinicians use many abbreviations as a timesaving convenience; however they can be prone to misinterpretation.

**Aim:** The aim of this practice review evaluation is to identify the top six error-prone abbreviations at a local Hospital and compare those results to previous review conducted at the same facility to detect any improvement in practice.

**Method:** Copies of inpatient medication charts were randomly selected from each ward over a one-week period. A sample size of 100 patients' charts was included in the audit. Only regular orders on all current medication charts were included in the review (excluding ceased orders). The audit tool used is based on indicator 3.3, "Percentage of medication orders that include error-prone abbreviations" published by the New South Wales, Australia; Therapeutic Advisory Group.

**Findings:** A total of 47 error-prone abbreviations were detected which equates to an overall incidence of 6% (n=784 medication orders) which is higher than the results of the audits of 2008 (5.1%) and 2012 (5.3%).

The most common error-prone abbreviation were 'mcg or ug' (57.4%), 'od or OD' (23.4%) and 'U or IU' (19.1%). There were no 'leading zeros', 'trailing zeros' or 'qd or QD' abbreviation in the sample audited.

**Conclusion:** The audit suggests that the possible reasons for the increase in use of unapproved abbreviations may include: 1) junior medical officers were not instructed to use the New South Wales, Australia, Therapeutic Advisory Group guidelines or 2) some medical staff are in the habit of using varying abbreviations due to their previous work experience and practice standards. If these doctors had never received timely or direct feedback on their prescribing practices then they may not be aware that they are utilising error-prone abbreviations.

**Keywords:** Medication charts; Ambiguity; Error-prone abbreviations

### Introduction

Ambiguous abbreviations are one the most common and preventable causes of medication errors [1]. Clinicians use many abbreviations as a timesaving convenience; however they can be prone to misinterpretation. To ensure patient safety, orders must be clear and free from ambiguity, which means minimising the use of error-prone abbreviations [2].

In an effort to reduce errors, New South Wales, Australia, Therapeutic Advisory Group (NSW TAG) has devised a guideline on acceptable abbreviations. The Australian Commission on Safety and Quality in Health care now maintains this work. NSW TAG quality use on medicines indicator 3.3 "Percentage of medication orders that include error prone abbreviations" has been developed for routine collection and benchmarking within Australian Hospitals [3].

Medication errors are among the most commonly reported incidents in public hospitals. In the 2005-2006 report from the Incident Information Management System (IIMS), there were 17, 367 incidents in New South Wales public hospitals in which medication

error was the primary cause of harm with an additional 968 incidents in which medication error was the secondary cause of harm [4]. Given that medications form that basis of treatment, there is a need to implement safe and error-proof practices [4].

To address this issue, the New South Wales Therapeutic Advisory Group (NSW TAG) developed a guideline on acceptable abbreviations, "Recommendations for Terminology, Abbreviations, and Symbols used in the Prescribing and Administration of Medicines" [2]. In addition, "Indicators for the quality use of medicines in Australian hospitals" has been developed to guide hospitals in assessing their performance [3].

Prescribers use abbreviations as a means to save time and space. However, some abbreviations are prone to misinterpretation, a problem that is compounded by poor handwriting and the effect of being in close proximity to other words or numerals [1]. The frequency of error-prone abbreviations reported in other studies range from 8.4% to rates of between 30 and 33% [5]. It is recognised that these errors would be largely eliminated once electronic prescribing is adopted, however, in the meantime, interventions are required [6].

In the study by Abushaiqa et al. [7], the implementation of interventions reduced the incidence of unsafe abbreviations from

19.69% to 3.31% [7]. After obtaining baseline data, strategies implemented by the authors included in-service education programs, contacting prescribers to clarify orders with unsafe abbreviations and the provision of education material in the form of pocket cards, medical chart dividers and stickers.

Similarly, in the study by Taylor et al. [6], the implementation of interventions reduced the incidence of error-prone abbreviations from 31.8% to 18.7% [6]. Participants in the study regarded the focus on the use of local examples of actual errors or near misses as strength of the interventions implemented as it made the issues more relevant for the prescribers. As the study focused on the emergency department, the authors' recognised that in order to sustain improvements, interventions need to be incorporated as a part of the standard orientation to the hospital.

### Aim

The aim of this practice review evaluation is to identify the top six error-prone abbreviations at a local Hospital and compare those results to previous review conducted at the same facility to detect any improvement in practice.

### Study Design

Copies of inpatient medication charts were randomly selected from each ward over a one-week period. A sample size of 100 patients' charts was included in the audit. Only regular orders on all current medication charts were included in the review (excluding ceased orders).

The audit tool used is based on indicator 3.3, "Percentage of medication orders that include error-prone abbreviations" from the NSW TAG document, "Indicators for quality use of medicines in Australian hospitals" (NSW Therapeutic Advisory Group, 2007).

Auditors were provided with an instruction sheet, "Guide to Error-Prone Audit 2013" to refer to. The number of error-prone abbreviations examined was limited to the six most common ones, as identified by NSW TAG in the Table 1.

Error-prone Abbreviation	Intended Meaning	Why?	What should be used
µg, mcg or ug	Microgram	Mistaken as 'mg'	microgram
U or u	Unit	Mistaken as the numbers '0' or '4', causing a 10-fold overdose or greater (eg 4U seen as '40' or 4u seen as '44'). Mistaken as 'cc' so dose given as a volume instead of units (eg 4U seen as 4 cc)	Unit
No leading zero before a decimal point (eg 1.0 mg)	0.5 mg	Mistaken as 5 mg if the decimal point is not seen	Use zero before a decimal point when the dose is less than a whole unit
Trailing Zero after decimal point (eg 1.0 mg)	1 mg	Mistaken as 10 mg if the decimal point is not seen	Do not use trailing zeros for doses expressed in whole numbers

qd or QD	Every day	Mistaken as 'Qid', especially if the period after the 'q' or the tail of the 'q' is misunderstood as an 'i'	Daily
o.d or OD	Once daily	Mistaken as 'right eye' (OD-oculus dexter), leading to oral liquid medications administered in the eye. Can also be mistaken for BD (twice daily)	'daily', preferably specifying the time of the day, eg 'morning', 'mid-day', 'at night'

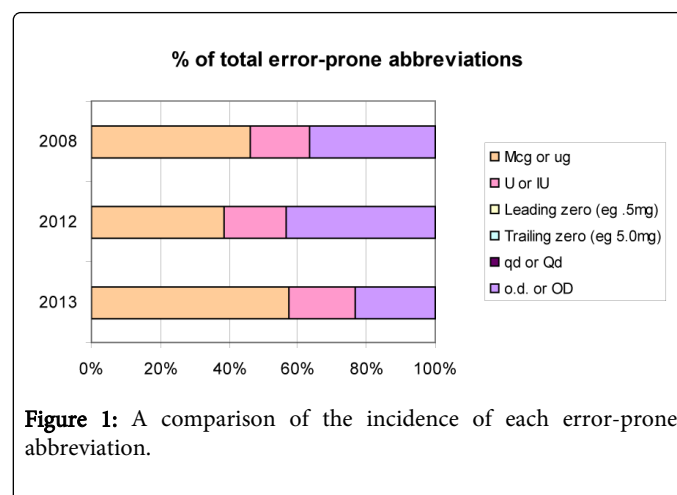
**Table 1:** Error-prone abbreviations - Taken from NSW Therapeutic Advisory Group (2007).

To calculate the overall incidence of the use of the specified error-prone abbreviation, the following equation was used, where the numerator is the number of medication orders that included error-prone abbreviations and the denominator is the number of medication orders in the sample.

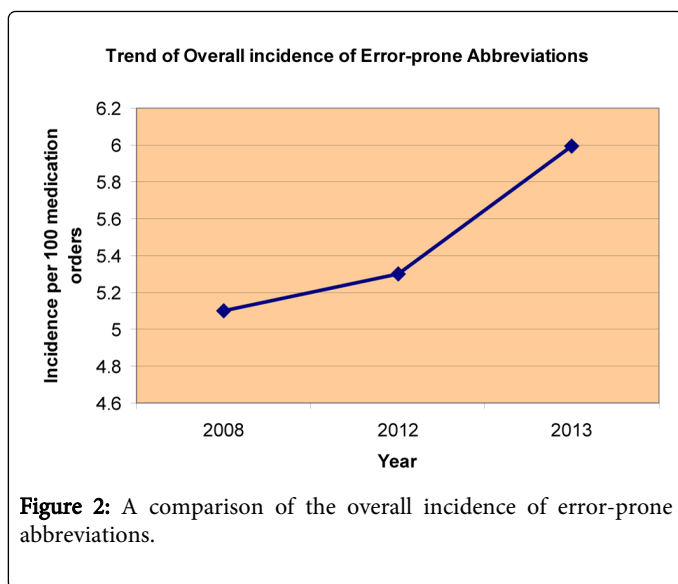
### Results and findings

The medication charts from 100 patients contained a total of 784 medication orders. Of these medication orders, a total of 47 error-prone abbreviations were detected which equates to an overall incidence of 6%. When compared to the results of the audits of 2008 and 2012, the overall incidence has increased from 5.1% and 5.3%, respectively (Figures 1 and 2).

The most common error-prone abbreviation in this year's audit were 'mcg or ug', making up 57.4% of the abbreviations, followed by 'od or OD' at 23.4% and 'U or IU' at 19.1%. There were no 'leading zeros', 'trailing zeros' or 'qd or QD' abbreviation in the sample audited. These results are comparable to the 2008 and 2012 audits.



**Figure 1:** A comparison of the incidence of each error-prone abbreviation.



### Limitations

A limitation of this audit is that it does not assess the use of error-prone abbreviations other than those specified.

### Discussion

As described by Dooley [5], Taylor [6] and Abushaiqa [7], abbreviations can lead to misinterpretation of the prescriber's intentions. This can result in both serious under- or over-dosage. Even placing the prescription on hold until the prescriber can be contacted for clarification may lead to deterioration in the patient's condition, or failure to relieve severe symptoms. Under-dosage although on the face of it safer, in fact may lead to therapeutic failure with serious consequences in for example fulminating infection. Over dosage has been documented to lead to serious adverse effects, morbidity and death. The approach has changed from the traditional 'name, blame, shame and prosecute' to now accept that errors arise from multiple contributing factors, and should be followed up with a detailed investigation of all contributing factors and an attempt to design protocols and training that will prevent errors from occurring.

- The implementation of the following strategies was recommended:
- Review the content of medical officers' hospital orientation sessions and educate about the NSW TAG abbreviations and where they can be accessed.

- Display the NSW TAG abbreviations on each ward and supply a simplified version as a small laminated lanyard card (to be attached to identification cards) as a quick reference.
- Target different wards each month for the auditing of the medication charts of a small number of inpatients, approximately ten, and provide timely feedback on results. Compare the results from different wards, and create some friendly competition and/or incentives for altering prescribing behaviour.

### Conclusion

The audit suggests that there has been limited uptake of the NSW TAG guidelines at audited hospital. There may be a few possible reasons for this. During hospital orientation in the past years junior medical officers were instructed to refer to local policy of acceptable abbreviations rather than the NSW TAG guidelines. In addition, some medical staff within our facility are in the habit of using varying abbreviations due to their previous work experience e.g. overseas training, frequently rotating to different institutions with divers practice standards etc. If these doctors had never received timely or direct feedback on their prescribing practices then they may not be aware that they are utilising error-prone abbreviations.

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