

Use of computerised prescriber order entry and clinical decision support system medication related alerts

Jamilah A. Alsaidan MSc [1,2], Tariq Alhawassi PhD [2,3,4], Professor Jane Portlock PhD [5] Sondus I. Ata MSc [4] Professor Hisham Saad Aljadhey PhD [6]; and Professor Bryony Dean Franklin PhD [1,7]

[1] Department of Practice and Policy, UCL School of Pharmacy, London, WC1N 1AX, UK [2] Department of Clinical Pharmacy, College of Pharmacy, KSU, Riyadh 11451, KSA [3] Medication Safety Research Chair, College of Pharmacy, KSU, Riyadh11451, KSA [4] Pharmacy Services Department, King Khalid University Hospital, King Saud University Medical City, Riyadh 12372, KSA [5] Pharmacy, School of Life Sciences, University of Sussex BN1 9QG, UK [6] Executive President, Saudi Food and Drug Authority, 3292 North Ring Rd AlNafel Area (Unit 1), Riyadh 13312-6288, KSA [7] NIHR Imperial Patient Safety Translational Research Centre, London, W2 1NY, UK



Introduction

Medication errors are clinically important problems that occur in both developing and developed countries, have financial consequences and lead to patient morbidity and mortality (Bates et al., 1995). While medication use has many processes and stages involved, most errors occur during either of these two stages; physician ordering and nurse administration (Leape et al., 1995). Computerised prescriber order entry (CPOE) is a system that enables prescribers to enter orders directly into a hospital computer system. Compared with handwritten systems, advantages include:

- Legibility
- A clear audit trail
- Orders can be rapidly routed to their destinations
- Allowing provision of decision support via computerised clinical decision support systems (CDSS) (Bates et al., 1994).
- CDSS is a computer application designed to aid diagnostic and therapeutic decision making in patient care. Recommendations are delivered in the format of messages, prompts, warnings or alerts. (Moja et al., 2014). Data from the USA, (Bates et al., 1998) and the UK (Dean Franklin et al., 2007) have shown that CPOE and CDSS might decrease medication errors, and with such improvements, further reductions in medications errors might be possible.

Aim and Objectives

CPOE was implemented in King Saud University Hospital Medical City (KSUMC) in May 2015, which provided an opportunity for research into its use for entering prescriptions, as well as management of alerts rising from CDSS, in the setting of a developing country, with different patient population, prescriber characteristics and healthcare system from the settings of previous research.

The aim was to gain insight and understanding on utilisation of the newly implemented CPOE and ancillary CDSS. The objectives were to:

- Determine numbers of medication order alerts generated from outpatient and inpatient settings at KSUMC
- Evaluate how often providers overrode and accepted alerts in both settings.
- Review documentation of clinician justification for overriding alerts.

Method

This study comprised of the retrospective review and analysis of reports generated by the system upon electronic prescribing of medication, from June 2015 to end December 2017. All medication orders entered into the CPOE system (inpatient and outpatient at KSUMC) were eligible for inclusion, together with any CDSS alerts generated for these orders. Data were obtained from system-generated reports. Numbers of alerts generated and those alerts overridden were reported.

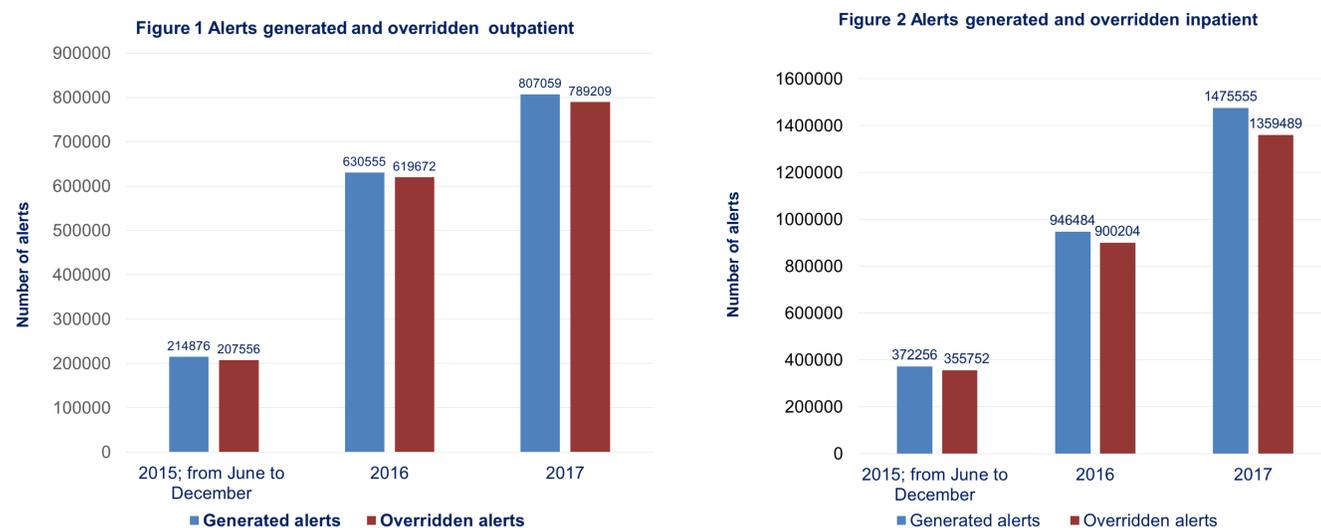
Discussion and conclusions

More than 90% of generated CDSS alerts were overridden by prescribers, with only 4% documenting free text justification of their choice. The alert 'drug duplication' (accounting for 80% of all alerts generated in this study) is generated when a medication is ordered if it was on the patients medication list in the past two years or if a therapeutic equivalent was also prescribed. Dose range alerts are active for specific medications, some dose ranges information has been reviewed by local clinical pharmacist staff, other dose ranges have not, and this is constantly being updated. The fact that more medications had been activated for dose range alerts generation could be a factor in rising number of alerts of this type and will lead to alerts generation with greater clinical relevance. Accurate documentation of patient information in electronic health records (existing allergies, up to date height and weight information) will ensure sensitivity of fired alerts. Triggering of drug duplication alerts so frequently could lead to alert fatigue, and cause the clinicians to override the other more relevant alerts.

Recommendations

Specificity and increased accuracy of alert generation is recommended. Updating dose range information and activation of the dose alerts of all high risk medication is also recommended. Tailoring the alert generation, reduction of duplicate alerts generation from both inpatient and outpatient settings will reduce irrelevant alerts in total without compromising patient safety. Studies evaluating the appropriateness of alert handling are planned. Also, a qualitative exploration of users' perceptions and their suggestions for improving the system is in progress.

Results



During the period June 2015 up to December 2017, there were 4,251,481 medication orders, 1,652,417 alerts were generated, of which 98% were overridden from the outpatient department. For every three medications ordered from the outpatient department, approximately one alert was generated. Figure 1 shows the numbers of alerts generated in the period June 2015 up to December 2015 and the alerts overridden from the outpatient department. From the inpatient department, during the period June 2015 up to December 2017 there were 862,829 medication orders and 2,794,295 alerts were generated, of which approx. 94% were overridden. For every medication ordered from the inpatient department, approximately three alerts were generated. Figure 2 shows the number of alerts generated in the period June 2015 up to December 2017 and the alerts overridden from the inpatient department. The highest frequency alert was 'drug duplication' (80% of all alerts), followed by 'dose range (approx. 11%) 'drug-drug interaction', (7%) and then 'drug-allergy' (1%). Egg allergy alerts were overridden 65% of the time, mostly for vaccines in the paediatric population.

Medications triggering the most dose range checking alerts were:

- Potassium chloride
- Insulin regular
- Heparin
- Warfarin
- Pantoprazole

There was poor documentation by the physicians in recording the reasons justifying overriding of alerts, often 'clinical judgement' or 'physician reviewed drug interaction' was chosen from the drop down menu. When prompted to enter free text, no other information was entered for 96% of the alerts.

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