



## Review Article

# Meaningful drug interaction alerts

Simranjeet Kaur<sup>1\*</sup>, Deepali Dhir<sup>1</sup>, Sujata Kaundal<sup>1</sup>, Amandeep Singh<sup>2</sup>

<sup>1</sup>Department of Pharmacology, Faculty of Pharmaceutical Sciences, PCTE Group of Institutes, Baddowal, Ludhiana, Punjab, India, <sup>2</sup>Departments of Pharmaceutics, ISF College of Pharmacy, Moga, Punjab, India

### Correspondence:

Simranjeet Kaur, Department of Pharmacology, Faculty of Pharmaceutical Sciences, PCTE Group of Institutes, Baddowal, Ludhiana, Punjab, India. Phone: +916280177913.

E-mail: simranjstl@gmail.com

**How to cite this article:** Kaur S, Dhir D, Kaundal S, Singh A. Meaningful drug interaction alerts. *Pharmaspire* 2020;12(2):121-123.

**Source of Support:** Nil,

**Conflicts of Interest:** None declared.

### ABSTRACT

Adverse drug reactions (ADRs) are the abnormal kind of the reaction which is associated with potential drug-drug interactions (DDIs) which further relate to so many side effects and the treatment failures. Studies have proven that with the aid of drug interaction alert systems, the medication error and potential adverse events can be reduced. DDIs are often implemented in the hospital computerized provider order entry (CPOE) with limited evaluation. Other strategies like clinical decision support (CDS) alert system is also applicable. It can be used along with the CPOE but they are associated with the alert fatigue problem arises when the physician overrides the alerts. In addition to this system, other computerized electronic databases and software's system also exist. These meaningful alert strategies are important for both the physician and for the patient safety profile both for inpatient and outpatient. Physician can totally trust the computerized software alert programs as it is not easy for each and every physician to remember all the potential DDIs. Assessing the quality of DDI alerts depends on various studies but one of the better ways is to directly compare the results of two alert programs and then select the results according to the criteria required. Physicians do agree to the point that due to the pop-up alerts, they are now more awarded about the potential drug interactions and some also feels that now they can prescribe the medication in much more safer manner.

**Keywords:** Adverse drug reactions, adverse drug events, drug interactions, clinical decision support, software

## INTRODUCTION

Adverse drug reactions (ADRs) are the abnormal kind of reactions which may occur due to the therapeutic action of drug or due to the formulation, that is, adverse drug events (ADEs) and it depends on person to person. The probability of ADRs is majorly increased through the drug interactions which are associated with so many treatment failure or side effects in both inpatient and outpatient. Hence, ADRs are mainly responsible for the increasing disease and death rates. Drug interactions occur when the pharmacology profile of the concurrently taken medication is altered by any other substance resulting in ADEs.<sup>[1]</sup> It can be with food, any chemical agent, or with any kind of drug but majorly drug-drug interactions (DDIs) are

associated with ADEs.<sup>[2-6]</sup> Some ADEs are considered as preventable ones as those arising from medication errors such as during the prescribing dispensing and administration.

To control these ADEs and the medication errors strategies like clinical decision support (CDS) alert systems, embedded with the computerized provider/physician order entry (CPOE) system came into existence.<sup>[4-5]</sup> These alert systems focus on the upliftment of patient health in more efficient, safe, and effective manner.<sup>[7]</sup> As they target the ordering stage of medication, where most of the medication errors and preventable ADEs occur.<sup>[8-13]</sup> These systems provide valuable tools which are either electronically or automatically generated like with the aid of CPOE system, health-care providers entered the medication and laboratory orders electronically which will ultimately reduce the number of prescription writing errors.<sup>[3]</sup> CDS system comprises variety of tools presented in an electronic health record (EHR) form which will assist the physicians in decision-

### Access this article online

<b>Website:</b> www.isfcppharmaspire.com	<b>P-ISSN:</b> 2321-4732 <b>E-ISSN:</b> XXXX-XXXX
--	--

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

making by providing them the patient-specific information and guidance at various stages in health-care process that will ultimately improve the patient safety in both inpatient and outpatient.<sup>[3,7]</sup> Drug dosing adjustments are also possible with CDS system. Although CDS is quite successful system that aims to provide ease for the patients, so they can do the right thing. CDS provides variety of tools but out of all interruptive alerts are the most common ones. Interruptive CDS is of two types: Active and excessive. Active interruptive CDS alerts are the one which requires clinician's response to continue and excessive are the ones which lead to "alert fatigues" resulting from the ignorance of relevant alerts.<sup>[8,11,12]</sup> The ignorance of alerts arises when the information is overloaded and the provider is overwhelmed with overrides of both appropriate and irrelevant alerts<sup>[9,10]</sup>. Hence, some efforts need to be taken to improve alert acceptance system rather than ignoring the appropriate one.<sup>[10]</sup> Reasons either in the free-text form or coded form need to be provided when users override an alert.<sup>[4]</sup>

Some important steps regarding the overrides:

- Provider's awareness regarding the potential harm needs to be documented
- Provider's awareness regarding the potential interaction needs to be communicated to the pharmacy (helpful for the inpatient setting rather than the outpatient setting)
- Provider's behavior needs to be influenced so they could justify their decision to override alert
- Needs to collect the data about the alerts which provider's commonly overrides and why there is need to improve such alerting systems.

Several electronic databases and screening software's are also there which are used as important tools in aiding the clinicians for the evaluation of potentially harmful DDIs which include Micromedex Drug Interactions, Lexi-Interact, iFacts, Medscape, and Epocrates, Stockley's Drug Interaction, You Script (i.e., PDA drug interaction software programs) as it is very difficult for the physician and pharmacist to remember and understand each and every drug interactions by themselves.<sup>[14,15]</sup> Hence, the physicians mostly trust the computerized DDIs software so that they can take the corrective actions accordingly. Among the different computer-based systems, personal digital assistant (PDA) drug interaction software programs are frequently used for finding interaction because of its ease of use and the updated things.<sup>[15]</sup>

Assessing the quality of DDI alerts is also an important step and different studies considered different parameters to evaluate it. Considering one of them as follows (1):

- Assessing quality of DDI alerts using compendia based on the usage and reputation Micromedex, Stockley's, and You Script is selected
- Assessing quality of DDI alerts using an expert panel
- The panelist member consists of five health-care professionals: Two clinical pharmacologists, two senior clinical pharmacists, and one geriatrician. Agreement is based on the panelist decision.

## DISCUSSION

While the physicians are treating the patients (inpatient and outpatient), the main aim is to improve the medication safety that will ultimately improve the patient safety. Many DDIs arise because of the ADRs which are often unpredictable but due to the physician negligence also DDIs occur so the physician needs to take extra precautions like while prescribing the medications to avoid DDIs. It is not possible that every physician and pharmacist could remember all the potential DDIs so various pop-up alert systems and computerized systems are there which will reduce the errors. Starting from the computer order entry linked with the CDS holds great promise for improving the medication safety, quality, and efficiency. However, many implementations have been made to these systems to overcome the override by including the more meaningful interruptive alerts. To manage and differentiate irrelevant data from the relevant one in more appropriate manner, DDIs screening software was opted. Clinicians used DDIs software to identify the potentially harmful drug interactions in the inpatient and outpatient setting. All the drug interactions software should have relevant specificity and sensitivity. PDA drug interaction software programs include Micromedex Drug Interactions, Lexi-Interact, iFacts, Medscape, and Epocrates, Stockley's Drug Interaction, and You Script.<sup>[1,2]</sup>

Drug interactions are related to the dose of the drugs when they are consumed together like some are capable of producing the interactions only when they are take in higher doses only not with the lower doses. Hence, an ideal DDI screening program should be able to ignore the doses of the drug that will not lead to the interactions.<sup>[15]</sup> To choose which screening software program is good and contains all the characteristics features, different studies give different criteria and rank the software accordingly. However, one of the better ways is to check the interaction pairs by more than one program, for example, two programs are considered then we can compare the results accordingly to know which system is fulfilling the sensitivity and specificity criteria.

Physicians do agreed that with the use of the automated drug alerts system their awareness regarding the drug interactions have been improved and many feels that the system helped them to prescribe the drug in more safer manner.<sup>[2]</sup>

## CONCLUSION

Hospitals across the world are utilizing the CPOE system and enabling the extra functionalities in their system such as pop-up alerts to prevent the potential DDIs through the reminder mechanism. However, due to the overexposure alert, fatigue may occur which is a common problem so measures should be taken to concentrate over the relevant alerts. Physician's activity should also be monitored by the administrative department whether they are facing any workload, for what reasons they override alerts. The patient safety department should design a more compassionately driven decision support system in the CPOE. To diminish the influence of noisy and irrelevant alerts, DDI databases must be modified accordingly. Drug interaction alert

system is not only beneficial to the patient as it will uplift the patient's medication safety level but is also useful for the clinicians to improve the decision-making process and reduce the errors. All clinicians should be able to view alerts and responses to alerts to optimize clinical care. Implementations need to be done in the system from time to time to prevent the alert fatigue and further research on easily obtainable alert metrics will provide a clear understanding of alert value and clinician responses to improve the efficiency of future alert improvement efforts.

## REFERENCES

- Meslin SM, Zheng WY, Day RO, Tay EM, Baysari MT. Evaluation of clinical relevance of drug-drug interaction alerts prior to implementation. *Appl Clin Inform* 2018;9:849-55.
- Yeh ML, Chang YJ, Wang PY, Li YC, Hsu CY. Physicians' responses to computerized drug-drug interaction alerts for outpatients. *Comput Methods Programs Biomed* 2013;111:17-25.
- Slight SP, Seger DL, Nanji KC, Cho I, Maniam N, Dykes PC, *et al.* Are we heeding the warning signs? Examining providers' overrides of computerized drug-drug interaction alerts in primary care. *PLoS One* 2013;8:e85071.
- Wright A, McEvoy DS, Aaron S, McCoy AB, Amato MG, Kim H, *et al.* Structured override reasons for drug-drug interaction alerts in electronic health records. *J Am Med Inform Assoc* 2019;26:934-42.
- Hussain MI, Reynolds TL, Zheng K. Medication safety alert fatigue may be reduced via interaction design and clinical role tailoring: A systematic review. *J Am Med Inform Assoc* 2019;26:1141-9.
- McEvoy DS, Sittig DF, Hickman TT, Aaron S, Ai A, Amato M, *et al.* Variation in high-priority drug-drug interaction alerts across institutions and electronic health records. *J Am Med Inform Assoc* 2017;24:331-8.
- Payne TH, Hines LE, Chan RC, Hartman S, Kapusnik-Uner J, Russ AL, *et al.* Recommendations to improve the usability of drug-drug interaction clinical decision support alerts. *J Am Med Inform Assoc* 2015;22:1243-50.
- Daniels CC, Burlison JD, Baker DK, Robertson J, Sablauer A, Flynn PM, *et al.* Optimizing drug-drug interaction alerts using a multidimensional approach. *Pediatrics* 2019;143:e20174111.
- Cho I, Lee Y, Lee JH, Bates DW. Wide variation and patterns of physicians' responses to drug-drug interaction alerts. *Int J Qual Health Care* 2019;31:89-95.
- Bryant AD, Fletcher GS, Payne TH. Drug interaction alert override rates in the meaningful use era: No evidence of progress. *Appl Clin Inform* 2014;5:802-13.
- Lowenstein D, Zheng WY, Burke R, Kenny E, Sandhu A, Makeham M, *et al.* Do user preferences align with human factors assessment scores of drug-drug interaction alerts? *Health Inform J* 2020;26:563-75.
- Gatenby J, Blomqvist M, Burke R, Ritchie A, Gibson K, Patanwala AE. Adverse events targeted by drug-drug interaction alerts in hospitalized patients. *Int J Med Inform* 2020;143:104266.
- Kaushal R, Shojania KG, Bates DW. Effects of computerized physician order entry and clinical decision support systems on medication safety: A systematic review. *Arch Intern Med* 2003;12:1409-16.
- Kheshti R, Aalipour M, Namazi S. A comparison of five common drug-drug interaction software programs regarding accuracy and comprehensiveness. *J Res Pharm Pract* 2016;5:257-63.
- Roblek T, Vaupotic T, Mrhar A, Lainscak M. Drug-drug interaction software in clinical practice: A systematic review. *Eur J Clin Pharmacol* 2015;71:131-42.