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Research Paper

Better specification of triggers to reduce the number of drug interaction alerts in primary care

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ABSTRACT

Objective: Drug interaction alerts (drug–drug and drug-disease interaction alerts) for chronic medications substantially contribute to alert fatigue in primary care. The aim of this study was to determine which events require (re)assessment of a drug interaction and whether using these events as triggers in clinical decision support systems (CDSSs) would affect the alert rate.

Methods: Two random 5% data samples from the CDSSs of 123 community pharmacies were used: dataset 1 and 2. The top 10 of most frequent drug interaction alerts not involving laboratory values were selected. To reach consensus on events that should trigger alerts (e.g. first time dispensing, dose modification) for these drug interactions, a two-step consensus process was used. An expert panel of community pharmacists participated in an online survey and a subsequent consensus meeting. A CDSS with alerts based on the consensus was simulated in both datasets.

Results: Dataset 1 and 2 together contained 1,672,169 prescriptions which led to 591,073 alerts. Consensus on events requiring alerts was reached for the ten selected drug interactions. The simulation showed a reduction of the alert rate of 93.0% for the ten selected drug interactions (comparable for dataset 1 and 2), corresponding with a 28.3% decrease of the overall drug interaction alert rate.

Conclusion: By consensus-based better specification of the events that trigger drug interaction alerts in primary care, the alert rate for these drug interactions was reduced by over 90%. This promising approach deserves further investigation to assess its consequences and applicability in daily practice.

1. Introduction

The detection and management of drug therapy related problems is important to prevent medication errors. Clinical decision support systems (CDSSs) are widely used to detect drug–drug interactions and drug-disease interactions (hereafter referred to as drug interactions) [1–3]. However, in daily clinical practice most alerts generated by CDSSs do not lead to an intervention: the specificity of alerts is low [4–7].

Up to now, one of the main strategies to improve the specificity of alerts has been the use of advanced clinical decision rules: the incorporation of more clinical characteristics (like renal function and potassium levels) in the algorithms generating alerts or not [7–13]. The results from these advanced clinical decision rules range from limited effect to a 90% decrease in the alert rate for a specific subset of alerts [7,9,11,12]. Most research into advanced clinical decision support has been performed in hospitals, where – unlike in the community – recent clinical values are generally readily available [7,11–15].

Differences between hospitals and primary care can have an important effect on the potential of CDSS improvement strategies. In primary care, the majority of the prescriptions concern chronic medications [16,17]. First time prescriptions and repeat prescriptions often trigger the same alerts. However, many drug interactions are mainly relevant at or immediately after the start of therapy [18–20]. In one study, first drug–drug interaction alerts were eight times more likely to be followed by an action compared with recurrent alerts [21].

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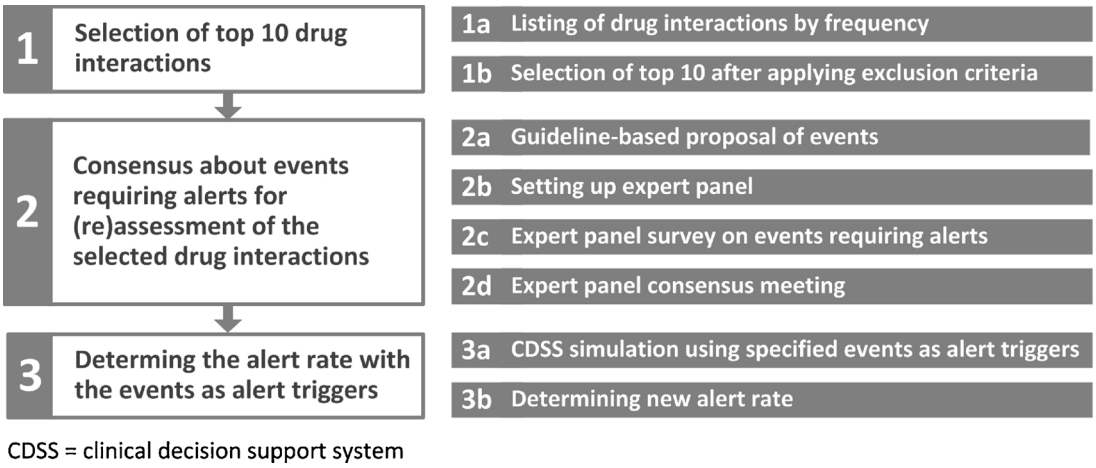

Fig. 1. Research steps.

Moreover, recurrent alerts have been shown to contribute substantially to alert fatigue in primary care [22]. So, for chronic medications, the need for an alert may be different between first time prescriptions and repeat prescriptions. Another difference with hospitals is that outpatients are not continuously monitored, and they are responsible for drug administration themselves. Therefore, health care professionals need to instruct the patients on correct drug use and monitoring. To evaluate whether the patient has understood the advice on a drug interaction and acts accordingly, follow up is needed, which can be supported by CDSS alerts.

Especially in primary care, it can be suboptimal when every repeat prescription without distinction triggers alerts. Alerts should only be triggered in situations requiring (re)assessment of the drug interaction by a health care professional. When it is possible to better specify events indicating this situation (e.g. a change of daily dose) per drug interaction, these events could serve as triggers for alert generation in CDSSs. The objective of this study was to determine which events require (re)assessment of a drug interaction and whether using these events as triggers in CDSSs would affect the drug interaction alert rate.

2. Methods

2.1. Setting

In the Netherlands, over 50% of the community pharmacies use the same pharmacy information system (Pharmacom® by TSS PharmaPartners®) that includes clinical decision support. The system's electronic patient record contains a dispensing history and coded chronic diseases. During processing of prescriptions (including prescriptions both from general practitioners [GP's] and from medical specialists in outpatient clinics), the system generates drug therapy alerts, including drug–drug interaction alerts and drug-disease interaction alerts. First time prescriptions and repeat (renewal) prescriptions trigger identical alerts. Drug interaction alerts are based on the comprehensive drug information database of the Health Base Foundation [18] (which is based on international scientific sources including Stockley's Drug Interactions [19]). Specific management recommendations and background information are available in the pharmacy information system. Identical alerts are generated for regular dispensing (for chronic medications: renewal of prescription every three months) and for multi-dose drug dispensing (generally repeated on a weekly basis) [23]. Pharmacists can suppress an alert manually for a specific patient for a specified period; suppression is lifted in case of changes in the registered patient information, e.g. change of dose, or refill non-adherence.

2.2. Dataset

250 randomly chosen pharmacies from 1080 community pharmacies using the Pharmacom system were asked to provide anonymized patient data over the period August 2012 to July 2014 [16,17]. Extracted data included patient characteristics (age, gender, coded chronic diseases), dispensed medications (including dispensing date, dose, dosing regimen, multi-dose drug dispensing), and all generated drug therapy alerts. The data were analyzed using Microsoft Access 2010 and SPSS (SPSS version 23.0; SPSS Inc. Chicago, IL). Two random non-overlapping samples of five percent of patients per pharmacy to whom at least one drug was dispensed in the period August 2013 to July 2014 were selected (dataset 1 and dataset 2). The dispensing history over the period August 2012 to July 2013 was used to determine first time dispensing and second time dispensing, first time dispensing being defined as the dispensing of a drug which has not been dispensed to the patient in the preceding 12 months, and second time dispensing as the first dispensing thereafter.

2.3. Study design

The investigation consisted of three main steps (Fig. 1):

2.4. Step 1. Selection of drug interactions

Step 1a) In dataset 1, drug interaction alerts were listed by frequency. For this listing only, alerts generated for first time prescriptions were excluded to select drug interactions with recurrent alerts.

Step 1b) Starting from the most frequently generated alerts, drug interactions were excluded when the management guidelines advised monitoring of laboratory values or blood pressure (Appendix A) [18,19]. For these drug interactions, laboratory values should be incorporated in alert generation in addition to the triggers included in this investigation, but availability of laboratory values is not yet commonplace in every community pharmacy [14,15]. The top 10 of remaining alerts were selected.

2.5. Step 2. Two-step consensus process on events requiring an alert

Step 2a) For the selected drug interactions, the management recommendations including background information were examined for information on situations which require (re)assessment of a drug interaction [18–20]. Based on this information, a proposal on events which should serve as alert triggers was drafted. Potential triggers considered for all drug interactions were first dispensing leading to alert, the second dispensing leading to alert, further dispensing of