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RESEARCH ARTICLE

A survey of attitudes, practices, and knowledge regarding drug–drug interactions among medical residents in Iran

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Abstract *Background* When prescribing medications, physicians should recognize clinically relevant potential drug–drug interactions (DDIs). To improve medication safety, it is important to understand prescribers' knowledge and opinions pertaining to DDIs. *Objective* To determine the current DDI information sources used by medical residents, their knowledge of DDIs, their opinions about performance feedback on co-prescription of interacting drugs. *Setting* Academic hospitals of Mashhad University of Medical Sciences (MUMS) in Iran. *Methods* A questionnaire containing questions regarding demographic and practice characteristics, DDI information sources, ability to recognize DDIs, and opinions about performance feedback was distributed to medical residents of 22 specialties in eight academic hospitals in Iran. We analyzed their perception pertaining to DDIs, their performance on classifying drug pairs, and we used a linear regression model to assess the association of potential determinants on their DDI knowledge. *Main Outcome Measure* Prescribers' knowledge and opinions pertaining to DDIs. *Results* The overall response rate and completion rate for 315 distributed questionnaires were 90% (n = 295) and 86% (n = 281), respectively. Among DDI information sources, books, software on mobile phone or tablet, and Internet were the most commonly-used references. Residents could correctly classify only 41% (5.7/14) of the drug pairs. The regression model showed no significant association between residents' characteristics and their DDI knowledge. An overwhelming majority of the respondents (n = 268, 95.4%) wished to receive performance feedback on co-prescription of interacting drugs in their prescriptions. They mostly selected information technology-based tools (i.e. short text message and email) as their preferred method of receiving feedback. *Conclusion* Our findings indicate that prescribers may have poor ability to prevent clinically relevant potential DDI occurrence, and they perceive the need for performance feedback. These findings underline the importance of well-designed computerized alerting systems and delivering performance feedback to improve patient safety.

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Keywords Drug–drug interaction · Information sources · Iran · Medication knowledge · Performance feedback · Prescribers' attitude

Impacts on practice

- In view of the residents' knowledge deficits concerning DDIs and the high prevalence of potential DDIs in physicians' prescriptions, it is recommended that targeted interventions, such as educational programs, be used to improve prescribers' knowledge.
- The high number of interacting drug combinations and limited ability of prescribers to identify them underscore the need for a (computerized) alerting systems which aid prescribers in recognition of potential DDIs.
- Access to electronic sources for DDIs, such as Internet and software on mobile devices, should be further facilitated in clinical settings.
- Prescribers stated interest in receiving feedback about interacting drugs in their prescriptions and their desire to receive such information via email and short messages. Hence, policy makers should make decisions about the use of this type of technology based interventions to improve patient safety.

Introduction

Drug–drug interactions (DDIs) are an important type of preventable adverse drug events (ADEs) which can lead to patient hospitalization or even death [1–3]. Due to the significant use of medications in medical therapy, it is essential that physicians can recognize potential DDIs. Given the ever-changing and expanding information about medications, it is difficult for prescribers to take DDI-relevant information into account when prescribing drugs [4]. So far, different strategies have been used to assist prescribers in identifying potential DDIs. Providing educational interventions [5, 6], facilitating access to DDI information sources [7], applying computerized alerting systems [8, 9], and delivering performance feedback [10–13] are among the most commonly used strategies.

To choose and apply the most appropriate strategy, it may be helpful to determine the level of targeted prescribers' DDI knowledge, their opinions on DDIs and the usefulness of related information sources, and also the factors that may be associated with their ability to recognize potential DDIs.

Previous studies have unanimously reported that prescribers' knowledge of DDIs is generally poor [14–16]. In a survey about prescribers' DDI knowledge in the US [15], only 42.7% of all drug pairs were categorized correctly by prescribers, and among demographic and practice factors only specialty and the degree of attention to DDI risk were related to prescribers' DDI knowledge [15]. In a similar survey, 44% of drug pairs were correctly categorized by Veterans Affairs clinicians [14]. Another study in the US showed that the ability of pharmacy and medical students in identifying important DDIs was poor [16].

In Iran prescriptions are mainly written on paper and there is no systematic mechanism (e.g. electronic prescribing system) to prevent DDIs. The results of a systematic review showed that the incidence of potential DDIs in Iran is relatively high [17]. To reduce potential DDIs in physicians' prescriptions by means of information technology-based feedback, a multiphase project was established in Mashhad, Iran. Since medical residents are usually the frontline in the inpatient medical team during the patient visit, their medication knowledge should be sufficient. In this phase of the project, we assessed medical residents' knowledge and opinions on potential DDIs.

Aim of the study

(1) To assess how well medical residents recognize clinically relevant potential DDIs; (2) to determine the current DDI information sources used by residents, their desire to receive performance feedback on co-prescription of interacting drugs in their prescriptions, and their preferences on method of receiving feedback.

Ethics approval

This study was approved by the Ethical Committee for Research in Mashhad University of Medical Sciences (MUMS) (Reference no. 931174, date: June 11, 2014).

Methods

Study design and setting

This cross-sectional, descriptive, and analytic study was conducted at MUMS, Iran, in 2014. The study population included all residents of 22 specialties (650 residents) in eight academic hospitals of MUMS. Sample size (n = 242) was determined by Krejcie and Morgan's table (based on a required confidence interval of 95%, and margin of error at 5%) [18], which is a common method of determining the representative sample size needed for a survey. Proportional stratified random sampling was used for sample selection.

Questionnaire and data collection

A survey questionnaire was developed based on the work of Ko et al. [15]. The questionnaire contained four sets of questions: (a) 10 demographic questions regarding characteristics of the residents and their practice; (b) 12 questions concerning the residents' opinions about DDIs and related information sources; (c) a 14-item DDI knowledge test; (d) four questions regarding the residents' opinions about performance feedback to reduce DDIs. Demographic and performance feedback questions were developed by an expert panel for the purposes of this study. Opinion and knowledge test questions were adopted from the previous study [15]. The process of translation and back-translation for these adapted questions were carried out from English to Persian and vice versa. Opinion questions were about the prescribers' perceptions about quality of DDI information provided by various sources and risk of DDIs for patients. The participants were requested to respond based on their perceptions on a five-point Likert scale. The DDI knowledge test consisted of 14 drug pairs which included four pairs that should not be used together, two pairs that may be used together but with monitoring, and eight pairs that could be used safely together. The content validity of the questionnaire was evaluated by 12 experts (six pharmacists, and six medical doctors and specialists) based on healthcare setting in Iran. They rated the level of representativeness and clarity of each item on a scale of 1–4 (1: 'do not agree', 4: 'completely agree') [19]. The content validity index (CVI) of measures was calculated for each item by computing the proportion of experts who considered the item as content-wise valid ('agree' or 'completely agree'). The average CVIs of both validity measures were greater than 0.8. Although the reliability of the questionnaire was confirmed in a previous study [20], we conducted a pilot test on 50 residents and used Cronbach's alpha to assess the internal consistency. Cronbach's alpha coefficients of the opinion and knowledge questions (0.72 and 0.87, respectively) were well above the limit of 0.70 suggested by Nunnally [21].

The first author participated in morning reports and journal clubs, described the purpose of the survey and the questionnaire to residents, and assured them that all information would be completely confidential. Residents who agreed to participate were given the questionnaire and asked to complete it anonymously without using any references or assistance. Because one of the main purposes of this study was to assess how well participants recognize clinically relevant potential DDIs, they were not allowed to use references or assistance when answering knowledge tests (unlike in clinical situations in which physicians have access to various information sources).

Statistical analysis

Frequencies and percentages were used to describe categorical variables. The relationship between residents' opinions concerning the usefulness of DDI information source and their usual source of DDI information was examined using Kruskal–Wallis test. The association between each potential determinant (originating from residents' characteristics) and residents' DDI knowledge was assessed using univariate linear regression model. Then confounders of the association were identified with the 10% change point of estimation rule based on the analytical model proposed by Jorgensen et al. [22]. Finally, each potential determinant and identified confounders were entered in a multivariate linear regression model. Statistical analysis was performed using SPSS statistical software (version 20, SPSS, Inc.).

Results

Characteristics of the sample

In total, 326 residents participated in morning reports and journal clubs. A total of 315 questionnaires were distributed among residents, out of which 295 were returned back (the response rate = 90%). There were 281 questionnaires were deemed suitable for analysis (the completion rate = 86%). Table 1 lists the respondents' demographic and practice characteristics.

Residents' sources of information and their general opinions about DDI

When more information was needed about a DDI, the respondents most commonly used a book (n = 120, 42.7%), software on mobile or tablet (n = 94, 33.5%), and Internet (n = 43, 15.3%) (Table 2). Overall, 203 (72.2%) and 166 (59.1%) of the respondents reported that DDI information was usually or always useful to them in future prescribing and sufficient for them to manage the interaction, respectively (Table 3). More than half of the respondents (n = 154, 54.9%) reported that when they consulted a source, DDI information changed their initial prescribing decisions. Kruskal–Wallis results indicated no significant differences between residents' three information source groups (clinicians, printed materials, and electronic sources) for five statements about their opinions concerning the usefulness of DDI information sources.

Table 1 Characteristics of the 281 respondents

Characteristic	N (%)
Sex	
Female	147 (52.3)
Male	131 (46.6)
Missing	3 (1.1)
Age range (year)	
21–25	3 (1.1)
26–30	98 (34.9)
31–35	111 (39.5)
36–40	35 (12.5)
41–45	22 (7.8)
>46	5 (1.8)
Missing	7 (2.5)
Specialty	
Anesthesia	17 (6)
Cardiology	18 (6.4)
Dermatology	10 (3.6)
Emergency medicine	39 (13.9)
Infectious	14 (5)
Internal medicine	28 (10)
Neurology	12 (4.3)
Neurosurgery	9 (3.2)
Nuclear medicine	5 (1.8)
Obstetrics and gynecology	23 (8.2)
Oncology	5 (1.8)
Ophthalmology	15 (5.3)
Orthopedics	11 (3.9)
Otolaryngology	11 (3.9)
Pediatrics	18 (6.4)
Psychiatric	17 (6)
Surgery	17 (6)
Urology	7 (2.8)
Occupational medicine	5 (1.8)
Years from graduation	
<1	45 (16)
1–3	49 (17.4)
4–10	64 (22.8)
11–20	25 (8.9)
>20	1 (0.4)
Missing	97 (34.5)
Practice experience (year)	
<1	30 (10.7)
1–3	78 (27.8)
4–10	82 (29.2)
11–20	35 (12.5)
>20	1 (0.4)
Missing	55 (19.6)
Number of practice sites	
1	111 (39.5)
>1	115 (40.9)
Missing	55 (19.6)
Primary practice location	
Office-based practice	13 (4.6)
Clinic	43 (15.3)
Hospital	217 (77.2)
Missing	8 (2.8)
Average working hours in practice per day (h)	
1–3	20 (7.1)
4–6	98 (34.9)
7–9	60 (21.4)
>9	71 (25.3)
Missing	32 (11.4)
Average number of prescriptions per day	
<20	128 (45.6)
20–30	65 (23.1)
31–40	29 (10.3)
>40	42 (19.4)
Missing	17 (6)
Average number of drugs per prescription	
2	41 (14.6)
3	146 (52)
4	66 (23.5)
>4	13 (4.6)
Missing	15 (5.3)

Prescribers' opinions about risk of DDI

While the majority of the respondents (n = 230, 81.8%) usually or always asked patients about their use of prescription drugs, about half of them (n = 137, 48.7%) asked about their use of over-the-counter (OTC) products (Table 4). Most of the respondents believed that the risk of DDI affected their selection of drugs (n = 194, 69%) and declared that they had seen a patient who had a drug interaction that caused temporary or permanent harm (n = 195, 69.4%). According to 187 (66.5%) of the respondents, a DDI was more frequently caused by drugs that were prescribed by multiple prescribers compared to the same prescriber (n = 7, 2.5%) and self-medication by patients (n = 82, 29.2%).

Residents' ability to recognize potential DDIs

The average percentage of correctly classified drug pairs was 41.5% ± 21.7. Among all the drug pairs, the pair alprazolam and ketoconazole was the least-correctly classified pair (n = 31, 11%), while amoxicillin and

Table 2 Residents' sources of DDI information

Source	N (%)
Question: When you want to learn more about a DDI, what reference do you use? (choose only one)	
Pharmacist	5 (1.8)
Colleague (physician)	11 (3.9)
Book	120 (42.7)
Package insert	3 (1.1)
Internet	43 (15.3)
Software on mobile or tablet	94 (33.5)
Software on computer	1 (0.4)
Drug and poisoning information center	2 (0.7)
Others[a]	2 (0.7)
Question: When one of your patients is about to be exposed to a potential DDI, who usually informs you that the interaction may be present?	
Pharmacist	33 (11.7)
Computerized alert system	3 (1.1)
Mobile or tablet	70 (24.9)
Others[a]	115 (40.9)
Missing	60 (21.4)

DDI drug–drug interaction

[a] 'Others response' refers to information resources other than pharmacist, computerized alerting system or mobile-tablet

acetaminophen was the most-correctly classified one (n = 245, 87.2%) (Table 5). More than 80% of the respondents could not correctly identify the following two contraindicated DDIs: ciprofloxacin + theophylline (n = 49, 17.4%) and alprazolam + ketoconazole (n = 31, 11%)). Regarding two drug pairs that need monitoring, only about one-third of the respondents categorized them correctly. The average percentage of incorrectly classified interacting drug pair (contraindicated or monitoring-required pair) as having no interaction (i.e. false-negative error) was 12.2% ± 9.3. By contrast, the average percentage of incorrectly classified a non-interacting drug pair as having interaction (i.e. false-positive error) was 19.2% ± 11.3.

Residents' desire to receive performance feedback

Overall, 268 (95.4%) respondents wished to receive performance feedback on co-prescription of interacting drugs in their prescriptions. Regarding the time interval to receive feedback, 'at the end of the month' was the most preferred one (n = 110, 39.1%), followed by 'at the end of the week' (n = 65, 23.1%), 'dispense time' (n = 42, 14.9%), and 'at the end of the day' (n = 31, 10.7%); the least preferred time interval was 'at the end of the 6 months' (n = 20, 7.1%). A total of 265 respondents (94.3%) selected at least one preferred method of receiving feedback (Table 6). The majority of the respondents (n = 166, 59.1%) selected short message service (SMS) as their first preferred choice, followed by electronic mail (email) (n = 68, 24.2%).

The results of the regression models

The results of the regression models (univariate and multivariate) showed that no residents' characteristics,

Table 3 Residents' general opinions about their usual sources of DDI information

Question[a]	Usually and always N (%)				*P* value[b]
	Overall	Clinicians (physician and pharmacist)	Printed materials (book and packet insert)	Electronic sources (internet and software on mobile, tablet, or computer)	
How often is the drug interaction information new to you?	21 (7.5)	0 (0)	9 (7.5)	12 (8.6)	0.78
How often is the drug interaction information relevant to the patient?	63 (22.8)	3 (18.8)	31 (25.5)	29 (21.2)	0.12
Is the drug interaction information sufficient for you to manage the interaction?	164 (59.2)	9 (56.3)	77 (62.6)	78 (56.5)	0.88
How often does the drug interaction information change your initial prescribing decisions?	152 (54.9)	7 (43.8)	70 (57.4)	75 (54.3)	0.46
How often is the drug interaction information useful to you in future prescribing?	201 (72.6)	13 (81.3)	92 (76.0)	96 (70.6)	0.45

DDI drug–drug interaction

[a] Choices for response: 1 = never, 2 = seldom, 3 = sometimes, 4 = usually, 5 = always

[b] Kruskal–Wallis test

Table 4 Residents' opinions about risk of DDI

Question[a]	Usually and always N (%)
How frequently do you ask patients about their use of prescription drugs?	230 (81.8)
How frequently do you ask patients about their use of OTC products?	137 (48.7)
How often does the risk for a drug interaction affect your selection of a drug product?	194 (69)

OTC over-the-counter

[a] Choices for response: 1 = never, 2 = seldom, 3 = sometimes, 4 = usually, 5 = always

Table 5 Residents' responses regarding DDIs[a] [N (%[b])]

Drug pair	Should not be used together (contraindicated)	May be used together, but with monitoring	No interactions	Not sure[c]
Warfarin and cimetidine	**103 (36.7)**	122 (43.4)	14 (5)	42 (14.9)
Sildenafil and bupropion	67 (23.8)	43 (15.3)	**54 (19.2)**	117 (41.7)
Ciprofloxacin and theophylline	**49 (17.4)**	99 (35.2)	71 (25.3)	62 (22.1)
Cyclosporine and rifampicin	42 (14.9)	**97 (34.5)**	27 (9.6)	115 (40.9)
Warfarin and verapamil	28 (10)	61 (21.7)	**99 (35.2)**	93 (33.1)
Captopril and simvastatin	15 (5.3)	22 (7.8)	**189 (67.3)**	55 (19.6)
Amoxicillin and acetaminophen	1 (0.4)	11 (3.9)	**245 (87.2)**	24 (8.6)
Atenolol and ranitidine	3 (1.1)	27 (9.6)	**195 (69.4)**	56 (20)
Digoxin and clarithromycin	65 (23.1)	**90 (32)**	22 (7.8)	104 (37)
Glibenclamide and alendronate	10 (3.6)	44 (15.7)	**81 (28.8)**	146 (52)
Sildenafil and isosorbide dinitrate	**187 (66.5)**	27 (9.6)	9 (3.2)	58 (20.6)
Zolpidem and metformin	6 (2.1)	44 (15.7)	**106 (37.7)**	125 (44.5)
Losartan and isosorbide dinitrate	11 (3.9)	38 (13.5)	**105 (37.4)**	127 (45.2)
Alprazolam and ketoconazole	**31 (11)**	88 (31.3)	62 (22.1)	100 (35.6)

[a] Numbers in bold type represent correct answers

[b] Due to rounding, percentages may not add to 100

[c] Missing data were considered as 'not sure'

Table 6 Frequencies and percentages of residents' preferred methods to receive performance feedback

Choice to receive feedback	First choice N (%)	Second choice	Third choice
Short message service (SMS)	166 (59.1)	13 (4.6)	12 (4.3)
Electronic mail	68 (24.2)	56 (19.9)	26 (9.3)
Web site	13 (4.6)	31 (11)	44 (15.7)
Phone	10 (3.6)	15 (5.3)	10 (3.6)
Postal mail	8 (2.8)	6 (2.1)	9 (3.2)
Missing	16 (5.7)	160 (56.9)	180 (64.1)

including demographic and practice characteristics and workload (i.e. sex, graduation duration, number of practice sites, primary practice location, average length of practice per day, average number of prescriptions per day, the risk of DDI affected prescriber's selection of drugs, prescriber had seen a patient suffering from drug interaction), were associated with their DDI knowledge.

Discussion

This survey found that among DDI information sources, books, software on mobile or tablet, and Internet were the most commonly-used references. Residents could correctly classify only 41% of the drug pairs. An overwhelming majority of the respondents desired to receive performance feedback on co-prescription of interacting drugs in their prescriptions. They mostly selected information technology-based tools as preferred method of receiving feedback.

In this study, about half of the respondents used electronic sources to learn more about DDIs, while in a similar study only 38% of prescribers had used this type of sources [15]. A possible explanation for this might be that the population in the present study has been relatively young and people in this age group are usually interested in information technology. In contrast to other findings [15, 23], a small proportion of the respondents in our survey (1.8%) reported that they ask a pharmacist when they want to learn more about a DDI. It may be that the participants in this study did not pay attention to the pivotal role of clinical pharmacist in clinical care, though studies conducted in Iran have shown that clinical pharmacists' interventions effectively prevent medication errors [24–27].

Our findings on residents paying attention to asking patients about the use of prescription drugs compared to over-the-counter (OTC) products are in agreement with Ko et al.'s findings [15], which showed that prescribers asked patients about the use of OTC products less frequently than the use of prescription drugs. A possible explanation for this might be that prescribers pay attention to the risk of interaction between drugs and OTC products less than the interaction between two prescribed drugs. However, prescribers should consider that OTC products are frequently used for self-medication by patients and some of them may have interaction with prescription drugs [28–32]. Similar to Ko et al.'s results, most of the prescribers perceived that prescription by multiple prescribers is the main cause of interactions [15]. Electronic medical record systems, which automatically provide alerts on interactions between drugs prescribed for the patient, have the potential to solve this problem [7, 8].

The level of prescribers' knowledge on DDI is insufficient and our findings are comparable to others (our study: 41.45%, [15]: 42.7%, [14]: 44%). There are some differences between these studies. Unlike our study, in the study of Glassman et al. [14] the clinicians were allowed to use information sources when answering the knowledge test. In addition, the drug pairs which were evaluated in our study were the same as those in the study of Ko et al. [15], but different than in the study of Glassman et al. [14]. The authors in the previous study argued that the prescribers who were knowledgeable about DDIs probably participated more than those with lower DDI knowledge level (adjusted response rate = 7.9%) [15]. In our study residents with virtually all levels of DDI knowledge participated (adjusted response rate = 86%).

In this study the residents were asked about six DDIs that had been already considered clinically important by experts [33]. In the case of identification of these clinically important DDIs, our results were similar to those of a previous study [15]. In our study and the previous one [15], on average about 40% of respondents answered "not sure" and "no interaction" for these six clinically important DDIs. The results of both studies on these clinically important DDIs identically showed that, on the one hand, two drug pairs that were less frequently identified compared to others were Ciclosporin + Rifampicin and Alprazolam + Itraconazole (more than half of the respondents could not correctly identify them). On the other hand, two drug pairs that were more frequently identified compared to others were Sildenafil + Isosorbide mononitrate and Warfarin + Cimetidine (more than three quarters of the respondents correctly identified them).

Our results indicated that the vast majority of the targeted residents were interested in receiving performance feedback about co-prescription of interacting drugs in their prescriptions. Probably due to availability of mobile phones, most of the respondents selected short messages as the most preferred method of receiving feedback. The selection of email by the most of the respondents as the second preferred method may be explained by the fact that our study population was young adults and studies have shown that younger people are likely more interested in using technology [34].

Similar to two previous studies, linear regression analysis was developed to examine the association between prescribers' DDI knowledge scores and their demographic and practice characteristics [14, 15, 35]. Glassman et al. found that younger clinicians and those spending more half-days in clinic correctly categorized more interacting pairs [14]. Ko et al. indicated that the prescribers who reported that the risk of DDI affected their drug selection 'very much' had a higher DDI knowledge than those who reported that the risk affected their drug selection 'a little' or 'not at all' [15, 35]. Contrary to these previous studies, regression models revealed no significant association between residents' characteristics (e.g. graduation duration, average length of practice per day, and attention to the risk of DDIs) and knowledge of DDIs. A possible explanation for this is that probably our study population was homogeneous in terms of demographic and practice characteristics. Therefore, to determine the association between prescribers' DDI knowledge and their characteristics, a further study is required on a population with heterogeneous characteristics and sample size larger than that for the current study.

Due to the nature of the questionnaire distribution, the present study has two strengths compared to the previous ones [14, 15]. The response rate was high, so we are confident that residents with different levels of DDI knowledge participated in the study. Since a researcher was present when the participants filled out the questionnaire, they did not use any references to answer the knowledge test; whereas in the previous studies the researchers were not aware about the condition under which the questionnaire was completed [14, 15]. Some limitations to this survey need to be considered. The first limitation of this study is related to the 'Others' response to the question about who informs the residents that DDI may be present. Whilst, a high proportion of the participants (41%) selected this response, there is no data about these other sources. To determine which these other sources are, further investigation is needed. The included drug pairs in the knowledge test were the same for all medical specialties. It is recommended that future studies assess prescribers' knowledge in each specialty area with medications that are specific to that area. Another limitation of this study was that the participants were not allowed to use information sources when answering knowledge test; whilst, physicians in clinical situations usually have access to various drug information sources when prescribing. The last limitation is that participants were not allowed to select more than one option to answer the multiple choice questions in the questionnaire. This limitation was accepted in order to compare our results to previous study [15].

The findings of the present study have a number of implications for practice. Regarding residents' knowledge deficits concerning DDIs, found in the present study and the previous ones [14, 15], and high prevalence of potential DDIs in physicians' prescriptions [17, 36–39], it is recommended that targeted interventions, such as educational programs, be used to improve prescribers' knowledge. The high number of interacting drug combinations and limited ability of prescribers to identify them underscore the need for computerized alerting systems which aid prescribers in recognition of potential DDIs. Based on our results, electronic sources were used more than others to learn more about potential DDIs. So, it is recommended that the access to electronic sources in clinical settings be facilitated further. Regarding the prescribers' interest in receiving feedback about co-prescription of interacting drugs in their prescriptions and their desire to receive via email and short messages, policy makers should make decisions about the use of this type of information technology-based intervention.

Conclusion

Our findings and those of previous studies indicate that prescribers may have poor ability to prevent occurrence of DDIs. This underscores the need for computerized alerting systems to assist prescribers in identifying potential DDIs. Considering that most of the residents used electronic sources more than other sources to learn about DDIs, it is recommended that access to this type of sources in clinical settings be facilitated further. Regarding the interest of the participants to receive performance feedback, on their performance on co-prescription of interacting medications, via information technology-based tools such as short message and email, it is suggested that this type of interventions be used to improve medication safety.

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