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Clinically Significant Drug Interactions in Insured Outpatient Prescriptions at a Class I General Hospital in Vietnam in 2025: A Retrospective Descriptive Cross-Sectional Study

Nguyen Trong Du[1], Pham Minh Tuan[2], Dang Duy Chinh[3], Dang Thi Tham[4], Nguyen Thi Lan[5], Tran Thi Thu Trang[6]

[1]Department of Pharmacy, E Hospital; Hanoi, Vietnam
[2,3,4]Outpatient Department, E Hospital, Hanoi, Vietnam
[5]Hanoi University of Industry, Hanoi, Vietnam
[6]Thanh Do University, Hanoi, Vietnam

ABSTRACT:

Background: Drug interactions alter the efficacy and safety of treatment, particularly in older patients with multiple diseases, yet drug-disease interactions are rarely assessed together with drug-drug interactions in outpatient prescribing.

Objectives: To determine the frequency and characteristics of prescriptions with clinically significant drug interactions and to describe the most common interactions in insured outpatient prescriptions at E Hospital in 2025.

Methods: In this retrospective cross-sectional study, 162,671 insured outpatient prescriptions were screened against a predefined list of contraindicated, conditionally contraindicated, and major drug-drug interactions and contraindicated drug-disease interactions. Data were analyzed descriptively.

Results: Interactions were found in 2,588 prescriptions (1.59%). Patients had a mean age of 73.95 ± 7.75 years, and each prescription contained a mean of 3.81 ± 1.32 diagnoses and 2.92 ± 2.00 drugs. Contraindicated drug-disease interactions (49.81%) and major drug-drug interactions (48.15%) accounted for nearly all of these prescriptions. Three pairs made up 82.84% of the 1,544 major drug-drug interaction occurrences: allopurinol-perindopril (47.67%), amlodipine-simvastatin (17.94%), and allopurinol-indapamide (17.23%). Among 1,361 drug-disease interaction occurrences, the most frequent were angiotensin II receptor blockers or angiotensin-converting enzyme inhibitors combined with diuretics in chronic kidney disease (27.99% and 21.16%), metformin in chronic kidney disease (14.77%), statins in hepatic impairment (11.02%), and β-blockers in asthma or chronic obstructive pulmonary disease (9.11%).

Conclusion: Interactions were concentrated in a few drug pairs and disease groups. Screening should address drug-drug and drug-disease interactions together, prioritize frequent combinations, and integrate renal and hepatic function data into prescribing decision support.

KEYWORDS: drug interactions; drug-drug interactions; drug-disease interactions; outpatient prescribing; medication safety.

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**Corresponding Author: Tran Thi Thu Trang*

INTRODUCTION

A drug interaction occurs when the effect of one drug is altered by another drug or by the patient's disease condition, which may reduce therapeutic efficacy or increase the risk of toxicity and adverse drug reactions. Drug interactions are an important consideration in the rational and safe use of medicines, because the resulting harm to patients is preventable if interactions are detected and managed promptly (Magro et al., 2012; Pirmohamed, 2011; Tannenbaum & Sheehan, 2014).

The risk of drug interactions increases with longer life expectancy, the burden of noncommunicable diseases, and multimorbidity. Older patients often have several chronic conditions at the same time, such as hypertension, cardiovascular disease, diabetes

mellitus, gout, dyslipidemia, and chronic kidney disease, and therefore require long-term medication. Polypharmacy increases the number of possible drug combinations, while age-related changes in hepatic and renal function, pharmacokinetics, and pharmacodynamics may aggravate the consequences of some interactions (Davies & O'Mahony, 2015; Guthrie et al., 2015; Maher et al., 2014; Mangoni & Jackson, 2004).

Drug interactions fall into two main groups. Drug-drug interactions occur through pharmacokinetic mechanisms, which alter blood drug concentrations, or through pharmacodynamic mechanisms, in which the effect or toxicity is enhanced by actions on the same organ system. Consequences may include bleeding, cardiac arrhythmia, muscle toxicity, hypoglycemia, renal failure, or treatment failure (Cascorbi, 2012; Hines & Murphy, 2011). Drug-disease interactions occur when a drug worsens an existing disease, or when a disease alters the safety and efficacy of a drug, for example in patients with renal impairment, hepatic impairment, asthma, chronic obstructive pulmonary disease (COPD), gout, or Parkinson's disease. Because both groups contribute to the risk of a prescription, prescription review should consider both simultaneously.

Many drug interaction databases have been developed to support health care professionals, and they can be integrated into electronic prescribing systems to give early warning of hazardous combinations. However, alerts must be selective and sensibly prioritized: when there are too many alerts of low clinical value, physicians tend to override even the important ones (Kuperman et al., 2007; van der Sijs et al., 2006). Identifying interactions that are both highly severe and common in actual prescribing practice is therefore a necessary step before designing an alert list for a health care facility.

The frequency of drug interactions varies with age, number of drugs, number of comorbidities, disease patterns, and the method used to identify interactions (Björkman et al., 2002; Doan et al., 2013; Guthrie et al., 2015). Published studies have mostly focused on drug-drug interactions, in inpatients or in a specific disease group or drug class. Data on drug-disease interactions in outpatient prescribing, assessed together with drug-drug interactions across all prescriptions of a hospital over one year, remain limited. In Vietnam, a cross-sectional study of 1,203 outpatient prescriptions at a health center found that 36.7% of prescriptions had at least one clinically significant drug interaction and that 3% had a severe interaction (Nguyen et al., 2024). On a larger scale, a study of 2,365,811 outpatient prescriptions in Tehran, Iran, which screened the 100 most frequently prescribed drugs using Micromedex®, showed that 46.1% of prescriptions contained a potential drug-drug interaction (Aarabi et al., 2026). These two studies differ in the severity levels counted, and both focused on drug-drug interactions, so they do not show how much drug-disease interactions contribute to the risk of outpatient prescriptions.

E Hospital is a Class I general hospital that receives many insured outpatients with diverse disease patterns. Reviewing all insured outpatient prescriptions over one year can show which interactions should be prioritized for alerts and which patient groups should be prioritized for review. We therefore conducted this study with two objectives: (1) to determine the frequency and characteristics of prescriptions containing clinically significant drug interactions among insured outpatients at E Hospital in 2025; and (2) to describe the drug-drug and drug-disease interactions in these prescriptions.

MATERIALS AND METHODS

Study design: A descriptive cross-sectional study using retrospective data from health insurance (HI) outpatient prescriptions at E Hospital, Vietnam, in 2025.

Study setting: Outpatient Department and Department of Pharmacy (outpatient pharmacy), E Hospital.

Study period: From January 2026 to the end of September 2026.
Retrospective data collection period: From January 2025 to the end of December 2025.

Study population: Prescriptions of insured patients examined and treated as outpatients at E Hospital in 2025. A total of 162,671 prescriptions were included in the screening.

Prescriptions were included in the study when they met all of the following criteria: (1) outpatient prescription of a patient examined and treated at E Hospital during the study period; (2) prescription containing all the information needed to look up and analyze drug interactions, namely diagnosis, drug name, dose, route of administration, frequency of use, and duration of treatment; and (3) prescription of a patient of any age and sex.

Prescriptions were excluded when they met any of the following criteria: (1) inpatient or emergency prescription; (2) prescription lacking the information necessary for looking up and assessing drug interactions (DIs); (3) prescription of a patient participating in a clinical trial during the study period; or (4) prescription containing only topical drugs (for example, antiseptic solutions alone) or traditional medicines, which are not relevant to DI analysis.

Sample size: Total sampling was used. Insured outpatient prescription data at E Hospital in 2025 were extracted from the IsofH-HIS hospital management system. All prescriptions meeting the inclusion criteria and not meeting the exclusion criteria were included in the screening and analysis.

Data collection procedure: Prescription data were extracted from the IsofH-HIS hospital management system as electronic files. The data fields were then standardized and coded for analysis using Navicat software.

The drug interaction lists used in this study were developed in 2019 and updated periodically according to the hospital's formulary. Before the study, the research team reviewed and adjusted the lists according to the drugs used in insured outpatient prescribing at E Hospital in 2025. The lists comprised drug-drug interactions at the contraindicated, conditionally contraindicated, and major levels, together with drug-disease interactions at the contraindicated level.

After finalization, the interaction lists were coded and integrated into the data-processing workflow in Navicat. Prescription data were automatically matched against the reference lists to detect and classify interactions. The results of the screening steps were compiled into a dataset for statistical analysis.

The unit of analysis was the prescription. When a patient received prescriptions from two or more physicians on the same day, the drugs were pooled and counted as one prescription for the assessment of interactions.

Study variables: The study variables comprised the characteristics of patients with interaction-containing prescriptions (mean age, age group, and sex); the frequency and proportion of prescriptions with interactions by type and severity level; the characteristics of prescriptions with interactions (mean numbers of diagnoses and drugs per prescription, and the distributions by number of diagnoses and number of drugs prescribed); the number, proportion, and frequency of drug-drug interaction pairs at the contraindicated, conditionally contraindicated, and major levels; and the number, proportion, and frequency of contraindicated drug-disease interactions by drug or drug class and related disease.

Data processing and analysis: Data were processed and analyzed using descriptive statistics in SPSS version 27.0. Quantitative variables were presented as mean ± SD, and categorical variables as frequencies and percentages. The study performed descriptive analysis only and did not test statistical hypotheses.

Research ethics: The study was approved by the hospital's leadership before implementation.

RESULTS

Frequency and classification of prescriptions with interactions

Among the 162,671 insured outpatient prescriptions screened, 2,588 prescriptions had at least one interaction at the severity levels examined, accounting for 1.59% of all prescriptions. Among prescriptions with interactions, contraindicated drug-disease interactions (49.81%) and major drug-drug interactions (48.15%) accounted for the highest proportions (Table 1).

Table 1. Classification of prescriptions with interactions

Type of interaction	Number of prescriptions	Proportion of prescriptions with interactions (%)	Proportion of all screened prescriptions (%)
Contraindicated drug-disease	1,289	49.81	0.79
Major drug-drug	1,246	48.15	0.77
Conditionally contraindicated drug-drug	51	1.97	0.03
Contraindicated drug-drug	2	0.08	0.001
Total	2,588	100	1.59

Characteristics of patients and prescriptions with interactions

The age and sex characteristics of patients with prescriptions containing interactions are shown in Table 2.

Table 2. Characteristics of patients in the group of prescriptions with interactions

Characteristic	Category	Result
Age (mean ± SD), years		73.95 ± 7.75
Age group	≤ 40 years	0.08%
	41-60 years	4.89%
	61-80 years	75.33%
	≥ 81 years	19.71%
Sex	Male	51.67%
	Female	48.33%

The mean age of patients with interaction-containing prescriptions was 73.95 ± 7.75 years. The 61-80 age group accounted for the highest proportion (75.33%), followed by the group aged 81 years or older (19.71%); together, these two groups accounted for 95.04%. The proportion of males (51.67%) was slightly higher than that of females (48.33%).

The numbers of diagnoses and drugs in prescriptions with interactions are shown in Table 3.

Table 3. Characteristics of prescriptions with interactions

Characteristic	Category	Result
Number of diagnoses per prescription (ICD code)	Mean ± SD	3.81 ± 1.32
Distribution by number of diagnoses per prescription	1-2 diagnoses	13.27%
	3-4 diagnoses	62.53%
	5-6 diagnoses	19.86%
	7-8 diagnoses	3.88%
	9-10 diagnoses	0.47%
Number of drugs per prescription	Mean ± SD	2.92 ± 2.00
Distribution by number of drugs per prescription	≤ 2 drugs	47%
	3 drugs	29%
	4 drugs	16%
	5 drugs	6%
	≥ 6 drugs	2%

The mean number of diagnoses was 3.81 ± 1.32 per prescription, and the group with 3-4 diagnoses accounted for the highest proportion (62.53%), followed by the group with 5-6 diagnoses (19.86%). The mean number of drugs was 2.92 ± 2.00 per prescription; most prescriptions contained no more than three drugs (76%), whereas prescriptions with five or more drugs accounted for 8%.

3.3. Description of the interactions in prescriptions with drug interactions among insured outpatients

The frequency of contraindicated drug-drug interaction pairs in the screened prescriptions is shown in Table 4.

Table 4. Frequency of contraindicated drug-drug interactions

Interaction pair	Number of prescriptions	Proportion (%)
Gemfibrozil - Repaglinide (Gemfibstad 300 / Eurolux-1)	2	0.08 (of prescriptions with interactions); 0.0012 (of all screened prescriptions)

Of the 162,671 prescriptions screened, only two prescriptions contained an absolutely contraindicated drug-drug interaction between gemfibrozil and repaglinide, accounting for 0.0012% of all screened prescriptions and 0.08% of prescriptions with interactions (2/2,588). This very low frequency indicates that contraindicated drug pairs were almost absent from outpatient prescribing at E Hospital.

The distribution of conditionally contraindicated drug-drug interaction pairs is shown in Table 5.

Table 5. Frequency of conditionally contraindicated drug-drug interactions

Interaction pair	Number of prescriptions	Proportion (%)
Coryol (carvedilol) / Colchicine	3	5.88
Omnipaque (iohexol) / Metformin	25	49.02
Iopamiro (iopamidol) / Metformin	23	45.10
Total	51	100.00

Findings: Among the 51 prescriptions with conditionally contraindicated drug-drug interactions, the interaction between iodinated contrast media and metformin predominated. Specifically, Omnipaque-metformin was recorded in 25 prescriptions (49.02%) and Iopamiro-metformin in 23 prescriptions (45.10%); together, these two pairs accounted for 94.12% of cases. The Coryol (carvedilol)-colchicine pair was found in only 3 prescriptions (5.88%).

The distribution of the number of major drug-drug interactions per prescription is shown in Table 6.

Table 6. Distribution of the number of major drug-drug interactions per prescription

Number of interactions	Number of prescriptions	Proportion (N = 1,246) (%)
1 interaction	948	76.08
2 interactions	298	23.92
3 interactions	0	0
Total	1,246	100

Among the 1,246 prescriptions with major drug-drug interactions, 948 contained only one interacting pair (76.08%), whereas 298 contained two major interacting pairs (23.92%); no prescription contained three or more major interacting pairs. Most prescriptions therefore had a single major interaction, but nearly one-quarter contained two major interactions at the same time, indicating that a notable proportion of patients remain at risk of multiple adverse events caused by drug interactions.

The frequency of each major drug-drug interaction pair is shown in Table 7.

Table 7. Proportions of major drug-drug interaction pairs

No.	Drug-drug interaction		Occurrences	Proportion %
	First drug	Second drug		
1	Allopurinol	Perindopril	736	47.67
2	Allopurinol	Indapamide	266	17.23
3	Allopurinol	Enalapril	32	2.07
4	Allopurinol	Hydrochlorothiazide	32	2.07
5	Acetylsalicylic acid	Piroxicam	25	1.62
6	Amlodipine	Simvastatin	277	17.94
7	Colchicine	Atorvastatin	23	1.49
8	Colchicine	Simvastatin	54	3.50
9	Fenofibrate	Pravastatin	40	2.59
10	Fenofibrate	Rosuvastatin	11	0.71
11	Fluconazole	Atorvastatin	8	0.52
12	Fluconazole	Simvastatin	1	0.06
13	Fluconazole	Moxifloxacin	5	0.32
14	Moxifloxacin	Azithromycin	1	0.06
15	Moxifloxacin	Methylprednisolone	17	1.10
16	Perindopril	Telmisartan	10	0.65
17	Perindopril	Losartan	3	0.19
18	Perindopril	Valsartan	2	0.13
19	Vinpocetine	Sertraline	1	0.06
	Total		1,544	100

Findings: The research team recorded 1,544 occurrences of major drug-drug interaction pairs (in 1,246 prescriptions). The pairs were unevenly distributed, with most concentrated in a small number of drug pairs commonly used to treat chronic diseases.

The most frequent pair was allopurinol-perindopril, with 736 occurrences (47.67%), accounting for nearly half of all major interaction occurrences. This was followed by amlodipine-simvastatin with 277 occurrences (17.94%) and allopurinol-indapamide with 266 occurrences (17.23%). These three pairs accounted for 82.84% of all major interaction occurrences detected. The remaining pairs had low frequencies, ranging from 0.06% to 3.50%, and consisted mainly of interactions between statins and colchicine or fibrates, azole antifungals and statins, QT-prolonging drugs, nonsteroidal anti-inflammatory drugs (NSAIDs), and drugs acting on the renin-angiotensin system.

The distribution of contraindicated drug-disease interactions by drug or drug class and related disease is shown in Table 8.

Table 8. Contraindicated drug-disease interactions

No.	Drug or drug class	Interacting disease (ICD code)	Occurrences	%
1	Gemfibrozil	Chronic kidney disease (N18)	4	0.29
2	β-Blockers	Asthma (J45), chronic obstructive pulmonary disease (J44)	124	9.11
3	Trimetazidine	Parkinson's disease (G20)	19	1.40
4	ACE inhibitors combined with diuretics	Chronic kidney disease (N18)	288	21.16
5	ACE inhibitors combined with diuretics	Gout (M10)	27	1.98
6	ARBs combined with diuretics	Chronic kidney disease (N18)	381	27.99
7	ARBs combined with diuretics	Gout (M10)	45	3.31
8	Acetylsalicylic acid	Active gastric ulcer (K25)	13	0.96
9	Acetylsalicylic acid	Asthma (J45)	12	0.88
10	Statins	Hepatic impairment	150	11.02
11	Sulfonylureas	Type 1 diabetes mellitus (E10)	3	0.22
12	Sulfonylureas	Chronic kidney disease	3	0.22
13	Sulfonylureas	Hepatic impairment	81	5.95
14	Metformin	Chronic kidney disease	201	14.77
15	Metformin	Chronic obstructive pulmonary disease (J44)	6	0.44
16	Metformin	Acute liver failure	4	0.29
	Total		**1,361**	**100**

ACE, angiotensin-converting enzyme; ARBs, angiotensin II receptor blockers; ICD, International Classification of Diseases.

Findings: The research team recorded 1,361 occurrences of contraindicated drug-disease interactions, concentrated mainly in a few classes of drugs used to treat chronic diseases. The most frequent was an angiotensin II receptor blocker (ARB) combined with a diuretic in patients with chronic kidney disease (N18), with 381 occurrences (27.99%), followed by an angiotensin-converting enzyme (ACE) inhibitor combined with a diuretic in patients with chronic kidney disease, with 288 occurrences (21.16%). Third was metformin in patients with chronic kidney disease, with 201 occurrences (14.77%), followed by statins in patients with hepatic impairment (150 occurrences; 11.02%) and β-blockers in patients with asthma or COPD (124 occurrences; 9.11%). The remaining interactions accounted for lower proportions, including sulfonylureas in patients with hepatic impairment (5.95%), ARBs plus diuretics in patients with gout (3.31%), ACE inhibitors plus diuretics in patients with gout (1.98%), and trimetazidine in patients with Parkinson's disease (1.40%), whereas gemfibrozil in patients with chronic kidney disease, metformin in patients with COPD or acute liver failure, and sulfonylureas in patients with type 1 diabetes or chronic kidney disease each accounted for less than 1%.

DISCUSSION

Frequency of drug interactions and patient characteristics

This study screened 162,671 insured outpatient prescriptions at E Hospital in 2025 and identified 2,588 prescriptions (1.59%) with at least one interaction at the severity levels examined. This proportion reflects the interactions detected using the study's screening lists, which mainly comprised contraindicated, conditionally contraindicated, and major drug-drug interactions and contraindicated drug-disease interactions. Because of differences in the scope of interactions, classification criteria, and study populations, the results cannot be compared directly with studies that survey interactions of all severity levels or that focus only on patients taking multiple drugs. Although the detection rate was relatively low, the 2,588 prescriptions identified within one year show that interaction screening remains of practical value for ensuring medication safety in outpatient care.

Patients with interaction-containing prescriptions were predominantly older adults, with a mean age of 73.95 ± 7.75 years; those aged 61 years or older accounted for 95.04%. In addition, 86.74% of prescriptions had three or more diagnoses. This pattern is consistent with the changes commonly seen in older people, including increased comorbidity and altered physiological function that may affect drug pharmacokinetics and pharmacodynamics (Davies & O'Mahony, 2015; Mangoni & Jackson, 2004). However, the study described only the characteristics of prescriptions with interactions and did not compare them with prescriptions without interactions. There is therefore insufficient basis to identify older age or the number of comorbidities as factors associated with the occurrence of drug interactions in the study population.

Notably, the mean number of drugs per prescription with interactions was 2.92 ± 2.00; 47% of prescriptions contained no more than two drugs, and only 8% contained five or more. These findings show that interactions were detected not only in prescriptions with many drugs. This may relate to the characteristics of the screening lists: a drug-disease interaction can be recorded when a single drug is prescribed to a patient with a relevant diagnosis, whereas a drug-drug interaction can occur in a prescription containing only two drugs. In addition, insured outpatient prescribing data may not fully reflect the drugs that patients obtain from other sources. However, the study did not directly evaluate these possibilities. Therefore, selecting prescriptions for interaction review should not rely only on the number of drugs prescribed but should also consider the types of drugs and the patient's medical conditions.

Contraindicated drug-disease interactions

Contraindicated drug-disease interactions were recorded in 49.81% of prescriptions with interactions, slightly higher than major drug-drug interactions (48.15%). This suggests that reviewing only drug-drug interactions may miss a substantial proportion of alerts related to patients' diseases. Among all drug-disease interaction occurrences, those involving chronic kidney disease accounted for 64.44%, notably combinations of an angiotensin II receptor blocker or an ACE inhibitor with a diuretic in patients with ICD-10 code N18, which together accounted for 49.15%. These combinations require careful evaluation in patients with reduced renal function because they may affect renal hemodynamics, electrolyte balance, and the risk of acute kidney injury. However, they are not automatically contraindicated in every patient with chronic kidney disease; the appropriateness of treatment depends on the indication, the degree of renal impairment, and the specific clinical condition.

The interpretation of the results must take into account the limitations of the interaction detection method. Drug-disease interactions were identified by matching prescribed drugs against ICD diagnosis codes, without incorporating laboratory parameters to confirm the contraindication conditions. For example, the appropriateness of metformin in patients with chronic kidney disease depends mainly on the estimated glomerular filtration rate (eGFR) rather than on the presence of a chronic kidney disease diagnosis alone. Similarly, the degree to which some drugs must be restricted in patients with hepatic or renal impairment may vary with the severity of organ dysfunction. Therefore, the number of interaction occurrences detected by the screening lists does not equate to the number of clinically confirmed contraindicated cases. The findings suggest that laboratory data, particularly eGFR and liver function indices, should be integrated into the prescribing decision support system to improve the accuracy and appropriateness of alerts for individual patients.

Drug-drug interactions

Among 1,544 occurrences of major drug-drug interactions, the three pairs allopurinol-perindopril, amlodipine-simvastatin, and allopurinol-indapamide accounted for 82.84%. Allopurinol combined with ACE inhibitors or diuretics alone accounted for 69.04% of all major interaction occurrences. This concentration in a small number of drug pairs suggests that a focused review of commonly encountered combinations could support clinical pharmacy activities. However, the severity of each pair may differ among reference sources; it is therefore necessary to cross-check against reference databases and the specific conditions of use before making intervention recommendations. In addition, because the unit of analysis was the prescription, one patient may have contributed multiple prescriptions across follow-up visits; the recorded frequencies therefore do not directly reflect the number of patients with interactions.

Interaction pairs involving statins accounted for 26.81% of all major interaction occurrences, including combinations with amlodipine, colchicine, fenofibrate, and fluconazole. Depending on the pair, these combinations may increase the risk of muscle toxicity through pharmacokinetic interactions or additive adverse effects. Notably, amlodipine-simvastatin was the second most frequent pair (17.94%), which indicates a need to evaluate the simvastatin dose and to consider alternative drugs where appropriate. Alongside high-frequency pairs, some less frequent interactions, such as those involving moxifloxacin (23 occurrences; 1.49%), also deserve attention because they may relate to QT interval prolongation or an increased risk of tendon injury, depending on the co-administered drug. Therefore, alert priority should not be based on frequency alone but should also consider severity, potential clinical consequences, and preventability.

Contraindicated drug-drug interactions were recorded at a low frequency, comprising two prescriptions with the gemfibrozil-repaglinide combination. In contrast, 48 of the 51 prescriptions with conditionally contraindicated interactions involved a combination of iodinated contrast media with metformin. For this group, risk assessment and management decisions should be based on renal function, the route of contrast administration, and related clinical factors. The findings suggest that the prescribing decision support system should stratify alerts by severity and conditions of applicability: contraindicated interactions should receive clear, high-priority alerts, whereas interactions that depend on clinical conditions should be accompanied by information supporting assessment and by appropriate management guidance.

4.4. Implications for clinical pharmacy practice

The results show that the detected interactions were concentrated in certain drug pairs and drug-disease groups. The three most frequent drug-drug interaction pairs accounted for 82.84% of all major interaction occurrences, whereas the five most common

drug-disease interaction groups accounted for 84.05% of all drug-disease interaction occurrences. This concentration suggests the possibility of building a priority alert list based on frequency of occurrence, combined with severity stratification and appropriate management guidance. However, alert selection should consider potential clinical consequences, preventability, and conditions of applicability rather than frequency alone. This approach may improve the appropriateness of prescribing decision support systems and limit unnecessary alerts (Kuperman et al., 2007; van der Sijs et al., 2006).

For drug-disease interactions, integrating diagnostic information with laboratory indices, particularly renal and hepatic function, may help identify more precisely the cases that require alerts or intervention. In clinical pharmacy practice, it may be reasonable to prioritize the review of prescriptions for older adults, patients with multiple comorbidities, and patients with impaired hepatic or renal function, while paying particular attention to the commonly encountered drug combinations identified in this study. However, these are only directions proposed on the basis of descriptive results. The effectiveness of alert stratification and prioritized review needs to be evaluated in future studies using indicators such as the alert acceptance rate, changes in prescribing decisions, and drug-related adverse events.

4.5. Study limitations

This study has several limitations. First, it was conducted at a single hospital and examined only insured outpatient prescriptions, so the generalizability of the results to other health care facilities and patient groups is limited. Second, interactions were identified by reviewing prescribing data, without complete information on dispensing, actual drug use, drugs taken outside prescriptions, or related clinical events. The results therefore reflect the frequency of detected potential interactions, not the incidence of adverse events caused by drug interactions. Third, drug-disease interactions were identified mainly from diagnosis codes, without the laboratory parameters and clinical status needed to confirm contraindication conditions. Fourth, the results depend on the reference lists and interaction classification rules used; interactions outside the scope of the screening were not recorded. Finally, because the unit of analysis was the prescription, one patient may have been counted multiple times across visits. The study also did not compare characteristics between prescriptions with and without interactions, and there is thus insufficient basis to identify factors associated with, or risk factors for, drug interactions.

CONCLUSION

Among 162,671 insured outpatient prescriptions at E Hospital in 2025, 2,588 (1.59%) contained a contraindicated, conditionally contraindicated, or major drug-drug interaction, or a contraindicated drug-disease interaction. Patients with interaction-containing prescriptions were mainly older adults (mean age 73.95 ± 7.75 years), and most had multiple diagnoses, although the number of drugs per prescription was not high.

Contraindicated drug-disease interactions (49.81%) and major drug-drug interactions (48.15%) accounted for almost all prescriptions with interactions. The most frequent drug-drug pairs were allopurinol-perindopril, amlodipine-simvastatin, and allopurinol-indapamide, whereas drug-disease interactions were mainly associated with renal impairment, hepatic impairment, and chronic respiratory disease. The findings support building a priority alert list for both types of interaction, together with organ-function data, in the hospital's electronic prescribing system.

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