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Assessment of Outpatient Prescribing Practices at a District Medical Center in Vietnam: A Cross-Sectional Study

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Abstract*—Introduction:** *rational use of medicines is essential to optimize therapeutic outcomes and ensure patient safety. However, inappropriate prescribing practices still occur in many healthcare settings, particularly at primary healthcare levels.* ***Objectives: *to analyze outpatient prescribing practices, evaluate prescribing patterns using World Health Organization (WHO) prescribing indicators, and assess the prevalence of potential drug–drug interactions at Krong Nang District Medical Center, Dak Lak Province, Vietnam.* ***Methods:*** *a descriptive cross-sectional study was conducted on 420 outpatient prescriptions collected in 2023. Prescribing practices were assessed using WHO prescribing indicators. Potential drug–drug interactions were evaluated using online drug interaction databases. Data on patient demographics, prescribing indicators, and drug interactions were analyzed using statistical methods.* ***Results:*** *the average number of drugs per prescription was 2.87 (SD 0.98). Drugs prescribed by international nonproprietary names (INN) accounted for 72.47%, while 60.7% were from the Essential Medicines List. Antibiotics were prescribed in 67.4% of encounters, and no injectable drugs were prescribed. Vitamins and minerals appeared in 74.8% of prescriptions. Potential drug–drug interactions were identified in 3.8% of prescriptions using Drugs Interaction Checker and 6.43% using Medscape.* ***Conclusions:*** *several prescribing indicators did not meet WHO recommended standards, indicating the need for improvement in rational drug use.*

***Keywords*—** *Drug-drug interaction, Outpatient care, Prescription patterns, WHO prescribing indicators.*

I. INTRODUCTION

Medication errors represent a major global patient safety concern and are among the most common types of adverse medical incidents, accounting for approximately 39% of all reported adverse events. In the United States, medication errors are estimated to cause about 251,000 deaths annually, making them the third leading cause of death after cardiovascular diseases and cancer.

Among medication-related problems, prescribing errors (PEs) are particularly significant in hospital settings. These errors may lead to adverse drug reactions, negatively affect patient outcomes, prolong hospital stays, and increase the likelihood of hospital readmissions. The frequency of prescribing errors has been reported to increase when healthcare professionals lack clinical experience or during periods of heavy workload.

Evidence from several international studies highlights the high prevalence of prescribing errors. Studies conducted in hospitals in Brazil reported prescribing error rates ranging from 43.5% to 44.5% in handwritten prescriptions and approximately 8% in electronic prescriptions. Similarly, studies involving junior doctors in the United States and the United Kingdom have documented prescribing error rates of 5.9%–7.5% of prescriptions. A retrospective cross-sectional study conducted in the emergency department of the largest governmental hospital in Jordan found that among 1,330 patients and 3,470 prescriptions reviewed, more than one-fifth of patients (21.65%) experienced prescribing errors, with 76% of these errors classified as serious.

These errors not only compromise patient safety but also impose a considerable burden on healthcare systems. In the United Kingdom, prescribing errors are estimated to cost the National Health Service (NHS) up to £2.5 billion annually. The consequences of these errors include prolonged hospitalization, patient harm, and even increased mortality.

In addition to prescribing errors, irrational drug use—such as polypharmacy, inappropriate antibiotic use, overdosing, and self-medication without proper medical supervision—further increases the risk of adverse drug events (ADEs). The use of prescription medications generally increases with age; European data indicate that 46% of individuals aged 45–54 years use prescription drugs, rising to 87.1% among those aged over 75 years. Moreover, the risk of drug–drug interactions increases up to eightfold when patients are prescribed between two and ten medications. Adverse drug reactions and drug interactions therefore represent important contributors to worsening clinical outcomes.

Furthermore, antimicrobial resistance (AMR) has become an increasingly serious global public health threat, exacerbated by the growing prevalence of multidrug-resistant (MDR) organisms. Globally, approximately 500,000 new cases of multidrug-resistant tuberculosis are diagnosed each year. In 2018, about 87% of new tuberculosis cases were reported in 30 countries across Asia, Africa, and Latin America.

Given the significant clinical and economic consequences associated with medication and prescribing errors, effective and timely interventions are essential to promote the safe, effective, rational, and cost-efficient use of medicines. However, the prevalence and characteristics of prescribing errors may vary across healthcare settings and regions, highlighting the need for further investigation to provide evidence for improving medication safety practices.

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In Vietnam, the situation of prescribing and using drugs is also facing some difficulties, such as the abuse of antibiotics and the unreasonable prescribing of multiple drugs for one prescription. Combining multiple drugs in the treatment of multiple diseases or drug abuse is the cause of drug-drug interactions that affect the health of patients.

These shortcomings have existed in the health system and need specific and timely remedies to move towards safe, rational and economical use of drugs. Krong Nang District Medical Center is one of the medical facilities contributing to the health care of the people of Dak Lak province. During its operation, no research has been conducted to survey or evaluate the effectiveness of prescribing.

II. Methods and Materials

A. Inclusion and exclusion criteria

Selection criteria: Prescriptions were prescribed for outpatients with full information on the survey content.

Exclusion criteria: Prescriptions containing herbal medicines and traditional medicines.

B. Study setting and design

Study Setting: The study was conducted at Krong Nang District Medical Center, located in Dak Lak Province, Vietnam, serving as a primary healthcare facility in the region.

Study Design: A retrospective, descriptive cross-sectional survey was carried out from January to December 2023, analyzing outpatient prescriptions.

C. Sample size calculation

The sample size was calculated using the formula for estimating a single proportion:

$$n = \frac{z^2_{\left(1-\frac{\alpha}{2}\right)} \times p(1-p)}{d^2}$$

In which:

n = Required sample size (number of prescriptions to be collected for analysis).

z = Confidence coefficient corresponding to a significance level of α=0.05; from the statistical table, Z(1−α/2)=1.96.

p = Estimated proportion of the studied characteristic (p is selected as 50%).

d = allowable deviation between sample error and population error (choose d = ± 5%).

Thus, the minimum sample size required to carry out the topic is 384. With a large number of prescriptions, the topic takes an additional 10% of the sample, so the actual number of research samples rounded up is 420 prescriptions.

D. Data procesing and analysis

Descriptive statistics test: determine frequencies, percentages and averages.

Analyses were conducted using Microsoft Excel 2016 and SPSS 16.0.

Categorical variables: gender, age, number of drugs in the prescription, number of prescriptions with or without drug-drug interactions are presented as frequencies and percentages %.

Continuous variables: age, number of drugs are presented as mean ± standard deviation.

III. Results

A. Characteristics of patients

The majority of patients coming to see a doctor are of 45 - 65 years old (33.3%), which can be explained by the highest proportion of this age group in the population. The mean age of patients was 41.56 ± 23.16 years, with the youngest patient aged 12 months and the oldest aged 104 years. Detailed information is presented in Table I.

TABLE I. Age distribution of patients in the study sample

S. No.	Age group	Number of patients	Percentage (%)
1	< 72 months	25	6.0
2	6-17 years	82	19.5
3	18-44 years	100	23.8
4	45-64 years	140	33.3
5	≥ 65 years	73	17.4
6	Total	420	100%

The survey results of 420 prescriptions showed that female patients accounted for a higher proportion than male patients (51% female compared to 49% male).

Among the patients receiving treatment, 110 (26.2%) had a single disease, 227 (54%) had two concurrent diseases, and 83 (19.8%) had more than three comorbid conditions.

B. Prescription indicators

The average number of drugs per prescription was found at 2.87 ± 0.976, with the number of drugs per prescription ranging from a minimum of one to a maximum of five (see Table II).

TABLE II. Distribution of the number of medications per prescription

S. No.	Number of medications per prescription	Frequency (n)	Percentage (%)
1	1	35	8.3
2	2	107	25.5
3	3	173	41.2
4	4	87	20.7
5	5	18	4.3
Total		420	100

Of the 1206 drugs prescribed, 874 drugs (72.47%) were prescribed by their international nonproprietary names (INN), while 332 drugs (27.53%) were prescribed by their brand (trade) names.

Of the 420 prescriptions surveyed, 283 prescriptions contained antibiotics, accounting for 67,4%, with a total of 298 antibiotics prescribed. Among the 283 prescriptions containing antibiotics, 268 prescriptions included one antibiotic, accounting for 63.8%, while 15 prescriptions included two antibiotics, representing 3.6%.

Injectable drugs are considered difficult to use, as patients are generally unable to self-administer them and require assistance from healthcare professionals. Among the 420 outpatient prescriptions surveyed, none contained injectable medications.

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The rate of vitamin and mineral use according to the study was 74.8%. Most of the vitamins prescribed were in combination form, primarily the Vitamin B complex.

Prescribing essential drugs is an important prescription indicator. The percentage of drugs in the list of essential drugs is only 60.7%.

C. Drug-drug interaction

Research drug interactions of 420 prescriptions using Drugs interactions checkers and Medscape. Among the total of 420 prescriptions analyzed, 16 prescriptions (accounting for 3.8%) were found to have drug interactions according to the Drugs Interactions Checkers, and 27 prescriptions (accounting for 6.43%) showed interactions based on the Medscape database.

The results indicated that in both databases, Drugs and Medscape, prescriptions with one drug interaction accounted for the highest proportion (81.25% in Drugs and 96.3% in Medscape). Prescriptions with two drug interactions represented 18.75% in the Drugs database and 3.7% in the Medscape database.

Among the 19 interaction pairs identified in prescriptions from the Drugs database, 17 pairs (accounting for 89.47%) were classified as moderate interactions. These included pairs such as Cefuroxime–Rabeprazole, Rifampicin–Ethambutol, Cefuroxime–Magnesium hydroxide + Aluminum hydroxide, Cefuroxime–Lactobacillus acidophilus, Methylprednisolone–Magnesium hydroxide, Haloperidol–Olanzapine, and Methylprednisolone–Amlodipine. The remaining 2 pairs (10.53%) were classified as minor interactions: Allopurinol–Amoxicillin and Aspirin–Esomeprazole. No major (severe) interactions were detected.

Among the 28 interaction pairs identified in prescriptions from the Medscape database, 22 pairs (accounting for 78.57%) were classified as requiring close monitoring. These included interactions such as Metformin–Amlodipine, commonly prescribed in regimens for non–insulin-dependent diabetes mellitus and essential hypertension; Allopurinol–Amoxicillin, found in prescriptions for gout and acute pharyngitis; as well as Loratadine–Griseofulvin, Haloperidol–Olanzapine, Esomeprazole–Cefuroxime, and Methylprednisolone–Loratadine. Six interaction pairs (21.43%) were classified as minor, and no interactions of severe or contraindicated levels were detected.

IV. Discussion

A. Prescription indicators

World Health Organization recommends that the average number of medicines per prescription should range from 1.6 to 1.8 to promote rational and safe prescribing. Following the review of 420 prescriptions comprising a total of 1,206 prescribed medications, the mean number of medicines per prescription was 2.87 ± 0.976. This level of medication use in the outpatient setting exceeds the recommendation of the World Health Organization.

These findings suggest that prescribing practices at hospitals and medical centers frequently involve multiple-drug combinations. Prescriptions containing a high number of medications were predominantly observed among patients with multimorbidity. However, polypharmacy may contribute to reduced adherence to treatment guidelines, increased healthcare costs, unnecessary medication use, and potentially serious drug–drug interactions that could compromise patient safety.

At Krong Nang District Medical Center, the proportion of medicines prescribed by their International Nonproprietary Names (INN) was 72.47%, while the remainder were prescribed under brand names. This figure is lower than the 100% recommended by the World Health Organization and also lower than that reported in previous studies conducted at the outpatient department of a secondary care hospital in Sheema District, Western Uganda in 2023 (90.48%), and at public health centers in Dessie, Northeast Ethiopia (98%).

Generic medicines, identified by their active ingredient names, are generally substantially less expensive than brand-name products and contribute to improved access to medicines, particularly in low-income countries. Conversely, the frequent prescribing of costly brand-name medicines and the limited use of generics may impose unnecessary financial burdens on patients and strain hospital budgets.

According to the study findings, the proportion of patient encounters in which antibiotics were prescribed was 67.4%, substantially exceeding the 20.0%–26.8% threshold recommended by the World Health Organization.

Compared with international studies, this rate is considerably higher than that reported at a tertiary hospital in Northeast Ethiopia in 2019 (34.64%) and at public health centers in Dessie, Northeast Ethiopia (44%).

Most studies conducted in both developed and developing countries have documented antibiotic prescribing rates per encounter that exceed the recommendations of the World Health Organization. Inappropriate antibiotic use represents a global public health concern, contributing to antimicrobial resistance, the occurrence of adverse drug reactions, and increased rates of hospitalization.

A review of 420 outpatient prescriptions at Krong Nang District Medical Center revealed that none included injectable medications. This finding suggests that the Center has effectively restricted the prescribing of injectable drugs in the outpatient setting, likely in recognition of their higher associated risks.

Vitamins and mineral supplements were prescribed in 74.8% of the total prescriptions reviewed at the Center. According to the World Health Organization, there is no established optimal standard for the proportion of prescriptions containing vitamins and minerals. The Ministry of Health of Vietnam, as well as health authorities in several other countries, has included this indicator in prescribing studies to monitor patterns of vitamin–mineral use and to prevent potential overutilization.

Although vitamins are generally associated with few or no apparent adverse effects, their use warrants careful consideration. Adequate supplementation may confer health benefits; however, excessive intake can adversely affect patient health.

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The Essential Medicines List issued by the Ministry of Health serves as a fundamental reference for medicine supply at healthcare facilities, with the objectives of reducing treatment costs, promoting domestic pharmaceutical production, and facilitating international aid. Ensuring the availability of essential medicines within the community is therefore a critical component of public health protection and healthcare delivery.

Regular updates of the Essential Medicines List are warranted, and priority should be given to prescribing medicines included in the list to help reduce treatment costs and meet patients' healthcare needs. This is particularly important for disadvantaged populations, including the poor, ethnic minorities, and individuals living in remote, rural, and mountainous areas, to ensure equitable access to appropriate treatment options.

However, compared with the recommendations of the World Health Organization, the proportion of prescribed medicines included in the Essential Medicines List remains relatively low (60.7%).

B. Drug - drug interaction

Screening for potential drug–drug interactions using two electronic databases yielded different estimates of the proportion of prescriptions containing interactions. Among the 420 prescriptions reviewed, the "Drugs Interaction Checker" identified 16 prescriptions with potential interactions (3.8%), whereas "Medscape" detected 27 prescriptions (6.43%).

Of the 16 prescriptions with interactions identified by Drugs, 13 (81.25%) involved one interaction and 3 (18.75%) involved two interactions. Among the 27 prescriptions with interactions detected by Medscape, 26 (96.3%) involved one interaction and 1 (3.7%) involved two interactions.

Regarding severity classification, of the 19 interaction pairs identified by Drugs, 17 (89.47%) were classified as moderate and 2 (10.53%) as minor. Of the 28 interaction pairs identified by Medscape, 22 (78.57%) required close monitoring and 6 (21.43%) were categorized as minor. Neither database identified interactions classified as severe or contraindicated.

In cases of severe interactions, the concomitant use of the interacting agents would generally be contraindicated, and a careful risk–benefit assessment would be required. However, interactions of moderate or minor severity may receive limited clinical attention, and appropriate monitoring is not consistently implemented. This may reflect limitations in clinical pharmacy services at many healthcare facilities, as well as insufficient updating of prescribing information among physicians and pharmacists. Additionally, high patient volumes may constrain consultation time, thereby limiting the routine assessment of potential drug–drug interactions.

V. CONCLUSION

The average number of drugs in an outpatient prescription is 2.87 ± 0.98. Of which, the rate of prescriptions using antibiotics is 67.4%, the rate of drugs prescribed by international common names is 72.47%. Prescriptions with injections account for 0%, the rate of vitamin - mineral use is high at 74.8%. Essential drugs are prescribed at a rate of only 60.7%. Among the 420 prescriptions reviewed, potential drug–drug interactions were identified in 3.8% of prescriptions using the Drugs Interaction Checker and in 6.43% using Medscape. Most detected interactions were classified as minor to moderate in severity, and no contraindicated drug–drug interactions were identified.

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