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Original Article

Clinical pharmacists' interventions on the appropriate prescription of corticosteroids at a medical center in Vietnam between 2022 and 2023

[Intervenciones de los farmacéuticos clínicos sobre la prescripción adecuada de corticosteroides en un centro médico de Vietnam entre 2022 y 2023]

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Abstract

Context: The appropriate description of corticosteroids is an important issue in hospitals because this is a widely used drug. Clinical pharmacists' interventions can help improve the rational prescription of corticosteroids.

Aims: To evaluate clinical pharmacists' interventions on appropriate prescription of corticosteroids at a medical center in Vietnam from 2022 to 2023.

Methods: An interventional and cross-sectional descriptive study was conducted from January 1, 2022, to June 30, 2023.

Results: There were 726 patients (363 patients before intervention and 363 patients after intervention) and 22 doctors included in this study. The proportion of appropriate prescriptions of corticosteroids increased from 89% in pre-intervention to 96.4% in post-intervention. The portion of appropriate prescriptions of corticosteroids regarding contraindications went up from 62.5% in pre-intervention to 83.2% in post-intervention. The percentage of appropriate prescriptions of corticosteroids in terms of dosage and usage rose from 69.1% in pre-intervention to 85.7% in post-intervention. The general rationality grew from 46.3% to 81.3%. Doctors aged less than 30 years old with a bachelor's degree, 2-5 years of working experience, and not participating in training were more likely to prescribe corticosteroids inappropriately than other groups ($p<0.05$).

Conclusions: Clinical pharmacists' interventions have increased the rate of appropriate corticosteroid prescriptions at a medical center in Vietnam. Effective clinical pharmacists' interventions help improve the percentage of appropriate use of corticosteroids, so they need to be concerned in the future.

Keywords: corticosteroids; clinical pharmacist; outpatient; prescription; Vietnam.

Resumen

Contexto: La descripción adecuada de los corticosteroides es una cuestión importante en los hospitales porque se trata de un fármaco muy utilizado. Las intervenciones de los farmacéuticos clínicos pueden ayudar a mejorar la prescripción racional de corticosteroides.

Objetivos: Evaluar las intervenciones de los farmacéuticos clínicos sobre la prescripción adecuada de corticosteroides en un centro médico de Vietnam de 2022 a 2023.

Métodos: Se realizó un estudio descriptivo intervencional y transversal del 1 de enero de 2022 al 30 de junio de 2023.

Resultados: Hubo 726 pacientes (363 pacientes antes de la intervención y 363 pacientes después de la intervención) y 22 médicos incluidos en este estudio. La proporción de prescripciones apropiadas de corticosteroides aumentó del 89% en la preintervención al 96,4% en la postintervención. La proporción de prescripciones apropiadas de corticosteroides en relación con las contraindicaciones subió del 62,5% en la preintervención al 83,2% en la postintervención. El porcentaje de prescripciones adecuadas de corticoesteroides en cuanto a dosis y uso pasó del 69,1% en la preintervención al 85,7% en la postintervención. La racionalidad general creció del 46,3% al 81,3%. Los médicos de menos de 30 años, licenciados, con 2-5 años de experiencia laboral y que no participaban en cursos de formación eran más propensos a prescribir corticosteroides de forma inadecuada que otros grupos ($p<0,05$).

Conclusiones: Las intervenciones de los farmacéuticos clínicos han aumentado el porcentaje de prescripciones adecuadas de corticosteroides en un centro médico de Vietnam. Las intervenciones eficaces de los farmacéuticos clínicos contribuyen a mejorar el porcentaje de uso apropiado de corticosteroides, por lo que es necesario prestarles atención en el futuro.

Palabras Clave: corticosteroides; farmacéutico clínico; pacientes ambulatorios; prescripción; Vietnam.

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INTRODUCTION

Medicines play an indispensable role in patient health care. The patient has the right to choose a doctor. The doctor has the right to decide the type of diagnosis and the number of medical services for patients. In other words, the doctor is considered the first door to the use of medicine (Merino-Castelló, 2003). However, the prescribing phase can sometimes be difficult for health professionals, especially when the differences in risks and benefits of available therapies and guidelines are unclear (Ofori-Asenso and Agyeman, 2016).

Inappropriate prescribing is a prescription that is not consistent with good treatment standards. This can be present in five different ways, namely: underprescribing, over-prescribing, incorrect prescribing, extravagant prescribing, and multiple prescribing (Ofori-Asenso and Agyeman, 2016). Some studies have reported that inappropriate drug use and/or drug abuse would waste resources and lead to health consequences and economic losses in patients (Gosden et al., 2001). Inappropriate drug prescribing is considered a major challenge for global health systems (Ofori-Asenso and Agyeman, 2016). Many efforts have been made globally to improve the rational prescribing of medicines since WHO organized a major conference on the rational use of medicines in Nairobi in 1985 (Yousefi et al., 2012).

Corticosteroids are hormone mediators produced by the adrenal cortex and are used in many diseases such as Addison's disease, congenital adrenal hyperplasia (CAH), acute exacerbation of chronic obstructive pulmonary disease (COPD), inflammatory diseases, musculoskeletal diseases, dermatology, and prophylaxis in organ transplantation (Yasir et al., 2018). Corticosteroids constitute a double-edged sword. They bring significant benefits with a low incidence of side effects if used in appropriate doses and for limited durations; however, incorrect dosage and/or timing and careless discontinuation after prolonged use can cause serious consequences (Yasir et al., 2018). Furthermore, corticosteroids are used in all clinical departments, easily leading to inappropriate prescribing.

According to estimates by the World Health Organization (WHO), more than half of all corticosteroids are inappropriately prescribed, dispensed, and sold (Yousefi et al., 2012). Inappropriate use of drugs/medicinal products remains a major problem that most health systems around the world have faced, especially in developing countries with weak health systems, where mechanisms for regular monitoring of drug use are often not developed or sometimes do not exist (Behluli et al., 2017). A study by Rathod et al. (2013) in India showed that in most prescriptions, the intensity, quantity of steroid used, frequency, site, and duration of use were not mentioned. Key symptoms and diagnoses were not mentioned in approximately 85% of prescriptions (Rathod et al., 2013). Another study in Vietnam showed that 38.3% of corticosteroids were prescribed inappropriately (Tran and Pham, 2021). Interventions used in other countries may also be effective in reducing inappropriate corticosteroid prescribing. These interventions included clinical guidance, provision of essential medication lists, provision of workshops, targeted training based on problem-solving, training sessions for all parties (physicians, pharmacists, and patients) and helped improve regulatory mechanisms, availability of drugs of assured quality, availability of suitable alternatives for analgesics and the introduction of rational prescribing policies (Yousefi et al., 2012).

Although inappropriate corticosteroid prescribing is very important, there have been few studies investigating this issue, especially in Vietnam, where corticosteroid abuse has tended to increase recently and is a serious alarm (Ministry of Health Portal, 2020). This study was conducted to understand factors related to inappropriate corticosteroid prescription and evaluate the results of clinical pharmacists' interventions on appropriate corticosteroid prescription at a medical center in Vietnam between 2022 and 2023.

MATERIAL AND METHODS

Study design and subjects

Study design

An interventional and cross-sectional descriptive study was conducted from January 1, 2022, to June 30, 2023.

Research subjects

Prescriptions containing corticosteroids for outpatient treatment with health insurance in pre-intervention (January 1, 2022, to June 30, 2022) and in post-intervention (January 1, 2023, to June 30, 2023) at the Outpatient Department of Vinh Thuan District Medical Center, in Kien Giang province, Vietnam.

Outpatient doctor at the Outpatient Department of Vinh Thuan District Medical Center, in Kien Giang province, Vietnam.

Criteria of sample selection

Health insurance prescriptions contained corticosteroids that were prescribed by doctors assigned to

conduct outpatient examinations at the Outpatient Department of Vinh Thuan District Medical Center.

Doctors were assigned to directly examine outpatients at the Outpatient Department of Vinh Thuan District Medical Center.

Criteria of exclusion

Prescriptions were damaged, erased, missing pages, or not enough data.

Doctors in charge of outpatient examinations were absent from the unit for more than 3 months during the research period.

This study was performed in accordance with the ethical principles for medical research outlined in the Declaration of Helsinki 1964 as modified by subsequent revisions (World Medical Association, 2020). The study was approved by The Ethics Committee for Biomedical Research of Can Tho University of Medicine and Pharmacy (No. 22.010/HV/PCT-HDDD, 25 July 2022). The personal information of participants would be anonymized.

Data collection and sample size

The sample size was calculated according to the formula for estimating a population proportion, according to equation [1].

$$n = z^2_{(1-\alpha/2)}\, p\,(1-p)/d^2 \quad [1]$$

Where, n: The sample size; z: The value of the normal distribution (if α was 0.05, then z was 1.96); α: The probability of type I error (we use α = 0.05); p: The percentage of inappropriate prescriptions of corticosteroids, according to a study by Tran and Pham (2021), we use p = 0.383; d: The margin of error (we use d = 0.05).

Substituting the value of z, α, p, and d into the formula, we had $n = 1.96^2\ 0.383\ (1-0.383)/0.05^2 = 363$. Hence, in this study were collected 363 medical records.

Materials included patients and doctors. Variables describing patient characteristics included gender (male and female), age group (<5, 6-14, 15-59, and ≥60), disease group (circulatory system disease, respiratory system disease, digestive system diseases, endocrine/nutritional/metabolic diseases, and skin diseases). Variables describing characteristics of doctors included doctor's gender (male and female), doctor's age group (<30, 30-39, 40-49, and ≥50), doctor's qualification (bachelor's degree, specialist level 1/master's degree, and specialist level 2/PhD degree), experience (2-5, 6-10 and >10), and participation in training (yes and no).

The following variables described corticosteroid prescriptions before and after the intervention, including information related to prescribing regulations such as recording patient information (correct and incorrect), recording doctor information (correct and incorrect), writing drug information (correct and incorrect), writing drug use instructions (correct and incorrect), indications (rational and irrational), contraindications (rational and irrational), dosage and usage (rational and irrational), and general rationality (rational and irrational).

Correctness according to prescription regulations was assessed based on Circular 52/2017/TT-BYT (Ministry of Health, 2017) and Circular No. 18/2018/TT-BYT (Ministry of Health, 2018a).

Rationality was evaluated based on Circular 52/2017/TT-BYT (Ministry of Health, 2017), Circular No. 18/2018/TT-BYT (Ministry of Health, 2018a; 2018b), drug use instructions and treatment regimens from the Ministry of Health of Vietnam (Ministry of Health, 2015; 2016). Irrationality was considered as non-compliance with the documents mentioned above.

Operationalization of variables

Patient-related variables included gender (male and female), age (<5, 6-14, 15-59, and ≥60), and disease type (circulatory system diseases, respiratory system diseases, digestive system diseases, endocrine/nutritional/metabolic diseases, and skin diseases). Doctor-related variables encompassed gender (male and female), age (<30, 30-39, 40-49, and ≥50), qualification (Bachelor's degree-general doctor, Specialist level 1/Master's degree, Specialist level 2/PhD degree), experience (2-5 years, 6-10 years, and >10 years), and participation in training (no, yes).

According to prescribing regulations-related variables included patient information (correct and incorrect), doctor information (correct and incorrect), and instructions on the use of medicines (correct and incorrect). Appropriate prescribing of corticosteroids-related variables encompassed indication (rational and irrational), contraindication (rational and irrational), dosage and usage (rational and irrational), and general rationality (rational and irrational).

Intervention

The intervention period lasted four months (07/2022-12/2022) by the research team in coordination with clinical pharmacists of the Pharmacy Department of Vinh Thuan Medical Center and the professional planning department.

Method: Organizing training sessions or seminars, performing clinical assessments, checking and monitoring prescriptions.

Training: Two days, on July 8, 2022, and December 9, 2022. Content: Drug prescribing regulations according to regulations of the Ministry of Health (Ministry of Health, 2017; 2018a); instructions for safe and rational use of corticosteroids in prescribing drugs (Ministry of Health, 2016).

Workshop: Two sessions, on August 5, 2022, and November 10, 2022. Content: Updates on guidelines for diagnosis and treatment of chronic obstructive pulmonary disease according to GOLD 2022 (GOLD, 2022), musculoskeletal diseases (Ministry of Health, 2016), and dermatological diseases using corticosteroids (Ministry of Health, 2015).

Clinical assessments at medical center meetings: Eight times. Content: Updates on drug information for doctors through direct communication, documents, clinical pharmacy newsletters, and drug use instructions.

Inspection and supervision of prescriptions: Two times. Content: Reviews of irrational prescriptions and handles of administrative violations of inappropriate prescriptions.

Data processing and data analysis

IBM SPSS version 20 (IBM, Chicago, IL, USA) was used to enter, analyze, and process data. Qualitative variables were described as numbers and percentages. The χ^2 test was used to compare the difference in the percentages of appropriate prescriptions of corticosteroids before and after intervention and to find factors related to inappropriate corticosteroid prescriptions and doctor characteristics. The difference was statistically significant if $p<0.05$.

RESULTS

In Table 1, there were 726 patients (363 patients in pre-intervention and 363 patients in post-intervention) and 22 doctors. Characteristics of the materials are presented. Most patients in pre-intervention and post-intervention were female (51.5%), ≥60 years old (55.1%), and had respiratory disease (56.4%). Regarding doctors, males accounted for the majority (72.7%). The majority of doctors were in the age group of 40-49 (36.4%), had bachelor's degrees (77.3%), and had experience of >10 years (77.3%), participated in training (77.3% in pre-intervention and 100% in post-intervention).

In Table 2, the characteristics of corticosteroid prescriptions in pre-intervention and post-intervention are shown. Most patient information was recorded correctly (54% in pre-intervention and 93.4% in post-intervention). All doctor information was correct. 100% of drug use instructions in both pre-intervention and post-intervention were recorded correctly. The proportion of appropriate corticosteroid prescriptions increased from 89% in pre-intervention to 96.4% in post-intervention. The proportion of reasonable corticosteroid prescriptions regarding contraindications increased from 62.5% in pre-intervention to 83.2% in post-intervention. The proportion of appropriate corticosteroid prescriptions in terms of dosage and usage decreased from 69.1% in pre-intervention to 85.7% in post-intervention. The general rational percentage increased from 46.3% in pre-intervention to 81.3% in post-intervention.

In Table 3, factors related to inappropriate corticosteroid prescribing are shown. Doctors <30 years old were more likely to prescribe inappropriate corticosteroids than those ≥50 years old ($p<0.001$). Doctors with bachelor's degrees were 2.91 times more likely to prescribe corticosteroids inappropriately than those with special level 2/ Ph.D. degrees (OR = 2.91; 95% CI = 0.71-11.85; $p<0.001$). Doctors with experience of 2-5 years were more likely to prescribe corticosteroids irrationally than those with experience of >10 years ($p<0.001$). Doctors who did not participate in training were 17.52 times more likely to prescribe corticosteroids unreasonably than doctors who participated in training (OR = 17.52; 95% CI = 4.41-74.16; $p<0.001$).

DISCUSSION

This research evaluated prescribing based on two circulars issued by the Ministry of Health of Vietnam, including Circular 52/2017/TT-BYT and Circular 18/2018/TT-BYT. Information of patients, doctors, and drugs must be fully recorded (Ministry of Health, 2017; 2018a). The percentage of incorrect patient information was high in pre-intervention (46%). Incorrectly recorded information included incorrect information and missing information. The medical center was a place that received a large number of patients for examination and treatment, in which the number of prescribing doctors, according to the study, was only about 22 people, so doctors might miss information or not check the information carefully.

In Vietnam, currently, most medical centers use electronic prescriptions with computer systems (Ministry of Health, 2021; 2022), so most of the format criteria, such as doctors' information, drug information, and drug usage instructions, are pre-installed and then the percentage of the correct information on these criteria was 100% before and after the intervention. This electronic prescription has been applied for a long time in Vietnam. The most obvious effect of electronic prescribing is to reduce errors in prescribing, ensuring that prescriptions comply with the prescribed form, providing necessary support to prescribers with warnings and reminders to facilitate

prescribing and reduce the risk of errors, and avoiding misunderstandings due to the doctors' handwriting or prescription abbreviations, etc. The huge benefit of electronic prescribing is to create a close bond between the patient, prescriber, pharmacist, and all staff involved in the medication management process (Huynh et al., 2012; Porterfield et al., 2014; Tan et al., 2023).

The percentages of appropriate corticosteroid prescription in terms of indications (89%), contraindications (62.5%), dosage, and administration (69.1%) in this study were not high in pre-intervention. One limitation of electronic prescribing through computer systems is that the software cannot detect inappropriate use of corticosteroids on each specific patient, especially when the individualized treatment recommendation (ITR) plays an important role in the analytic framework for precision medicine nowadays (Meng et al., 2020).

Corticosteroids are one of the most widely prescribed drugs in the world. The worldwide corticosteroid market is estimated to be worth more than $10 billion per year (Ramamoorthy and Cidlowski, 2016). Corticosteroids have become a clinical mainstay in the treatment of many different inflammatory and autoimmune diseases, such as asthma, allergies, septic shock, rheumatoid arthritis, inflammatory bowel disease, and multiple sclerosis (Ramamoorthy and Cidlowski, 2016). Updating knowledge related to corticosteroid use in many different diseases for doctors is quite difficult. Another important thing is that corticosteroids are a group of drugs that need to be used at the right dosage and time.

Table 1. Characteristics of study subjects before and after the intervention.

Characteristics	Classification	Before the intervention, n (%)	After the intervention, n (%)
Patients			
Gender	Male	176 (48.5)	176 (48.5)
	Female	187 (51.5)	187 (51.5)
Age	<5	2 (0.5)	2 (0.5)
	6-14	14 (3.9)	14 (3.9)
	15-59	147 (40.5)	147 (40.5)
	≥60	200 (55.1)	200 (55.1)
Disease	Circulatory system diseases	28 (7.7)	27 (7.4)
	Respiratory system diseases	205 (56.4)	188 (51.8)
	Digestive system diseases	24 (6.6)	4 (1.1)
	Endocrine/nutritional/metabolic diseases	17 (4.7)	23 (6.3)
	Skin diseases	17 (4.7)	19 (5.2)
Doctors			
Gender	Male	16 (72.7)	16 (72.7)
	Female	6 (27.3)	6 (27.3)
Age	<30	3 (13.6)	3 (13.6)
	30-39	5 (22.7)	5 (22.7)
	40-49	8 (36.4)	8 (36.4)
	≥50	6 (27.3)	6 (27.3)
Qualification	Bachelor's degree (general doctor)	17 (77.3)	17 (77.3)
	Specialist level 1/Master's degree	2 (9.1)	2 (9.1)
	Specialist level 2/PhD degree	3 (13.6)	3 (13.6)
Experience	2-5 years	3 (13.6)	3 (13.6)
	6-10 years	2 (9.1)	2 (9.1)
	>10 years	17 (77.3)	17 (77.3)
Participation in training	No	5 (22.7)	0 (0)
	Yes	17 (77.3)	22 (100)

Table 2. Characteristics of corticosteroid prescriptions before and after intervention.

Characteristics	Classification	Before the intervention n (%)	After the intervention n (%)	p-value
According to prescribing regulations				
Patient information	Correct	196 (54)	339 (93.4)	**<0.001**
	Incorrect	167 (46)	24 (6.6)	
Drug information	Correct	363 (100)	363 (100)	-
	Incorrect	0 (0)	0 (0)	
Instructions on the use of medicines	Correct	363 (100)	363 (100)	-
	Incorrect	0 (0)	0 (0)	
Appropriate prescribing of corticosteroids				
Indication	Rational	323 (89)	350 (96.4)	**<0.001**
	Irrational	40 (11)	13 (3.6)	
Contraindication	Rational	227 (62.5)	302 (83.2)	**<0.001**
	Irrational	136 (37.5)	61 (16.8)	
Dosage and usage	Rational	251 (69.1)	311 (85.7)	**<0.001**
	Irrational	112 (30.9)	52 (14.3)	
General rationality	Rational	168 (46.3)	295 (81.3)	**<0.001**
	Irrational	195 (53.7)	68 (18.7)	

Table 3. Factors related to irrational corticosteroid prescription.

Characteristics	Classification	Irrationality n (%)	Rationality n (%)	OR (95% CI)	p-value
Doctor's gender	Female	51 (48.1)	55 (51.9)	1	-
	Male	144 (56)	113 (44)	1.17 (0.87-2.16)	0.1
Doctor's age	<30	30 (100)	0	-	**<0.001**
	30-39	25 (69.4)	11 (30.6)	2.27 (0.69-7.62)	0.15
	40-49	132 (47)	149 (53)	0.87 (0.32-2.43)	0.5
	≥50	8 (50)	8 (50)	1	-
	Bachelor's degree (general doctor)	176 (59.3)	121 (40.7)	2.91 (0.71-11.85)	**<0.001**
	Specialist level 1/Master's degree	16 (28.1)	41 (71.9)	0.78 (0.17-3.50)	**0.03**
	Specialist level 2/PhD degree	3 (33.3)	6 (66.7)	1	-
	2-5 years	31 (100)	0	-	**<0.001**
	6-10 years	8 (80)	2 (20)	4.26 (0.89-20.35)	0.059
	> 10 years	156 (48.2)	166 (51.6)	1	-
Participation in training	Yes	161(49.2)	166 (50.8)	1	-
	No	34 (94.4)	2 (5.6)	17.52 (4.41-74.16)	**<0.001**

Using the wrong dosage or at the wrong time or suddenly stopping the medication after taking it for a long time can cause serious consequences (Schäcke et al., 2002).

Yousefi et al. (2012) found that lack of physician awareness was one of the reasons for inappropriate corticosteroid prescribing. Therefore, intervention by providing knowledge to raise awareness for doctors was very necessary. According to many studies around the world, organizing training for doctors also brought positive results in prescribing drugs, helped reduce the percentage of inappropriate drug use, and optimized prescription in health facilities (Bekele et al., 2021; Hopkins et al., 2019; Huynh et al., 2023; Leppien et al., 2019; Mohamadloo et al., 2017). Hospitals in Vietnam have established clinical pharmacy units at the request of the Ministry of Health, and the role of clinical pharmacists in treatment has been constantly expanding and improving (Government, 2020; Horák et al., 2018; Onatade et al., 2018). We have implemented intervention solutions, including the provision of training sessions or seminars, clinical assessments at medical center meetings, and the provision of information about corticosteroid drugs to departments from July 2022 to December 2022. Therefore, in post-intervention, we recorded an increase in the general portion of reasonable corticosteroid prescriptions from 46.3 to 81.3% ($p<0.001$).

This study found several factors related to inappropriate corticosteroid prescribing by doctors. Doctors with bachelor's degrees were 2.91 times more likely to prescribe inappropriate corticosteroids than those with specialist level 2/ Ph.D. degrees (OR = 2.91; 95% CI = 0.71-11.85; $p<0.001$). Doctors with 2-5 years of experience were more likely to prescribe inappropriate corticosteroids than people with >10 years of experience ($p<0.001$). Physician factors (inaccurate diagnosis, inadequate awareness and knowledge, low experience, and poor medical education) were associated with inappropriate prescribing, according to the research by Mohamadloo et al. (2017). From the above results, effective interventions can help promote prescribing practices, improve diagnostic accuracy, enhance patient-centered counseling skills, optimize prescription, and improve patient health (Leonard et al., 2009; Mohamadloo et al., 2017).

Limitations of this study

This study had some limitations. The study was only conducted at one medical center in one province of Vietnam, so the results might not be representative of the entire population. The number of doctors participating in the study was still small. In the process of implementing clinical pharmacists' interventions, there were still many difficulties because the clinical pharmacist workforce was small. Moreover, clinical pharmacy was not focused, and the implementation of interventions was still affected by the COVID-19 pandemic.

CONCLUSION

The general percentage of reasonable corticosteroid prescriptions increased in post-intervention compared to pre-intervention with a statistically significant difference ($p<0.05$). Doctors aged less than 30 years old with a bachelor's degree, 2-5 years of working experience, and not participating in training were more likely to prescribe corticosteroids inappropriately than other groups. Clinical pharmacists' interventions were effective in improving the percentage of appropriate corticosteroid use, so they need to be concerned in the future. Finally, there is still a lot of missing information in the current research that future studies should pay attention to, such as the timing of corticosteroid use, the rational distribution of corticosteroids based on main diseases, as well as drug-drug, herb-drug, and food-drug interactions.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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REFERENCES

Behluli E, Nikoloski M, Spahiu L, Dodov MG (2017) Evaluation of attitudes of health care professionals towards the use of corticosteroids in the Republic of Kosovo. Maced Pharm Bull 63: 73-77. https://doi.org/10.33320/maced.pharm.bull.2017.63.02.008

Bekele F, Fekadu G, Bekele K, Dugassa D, Sori J (2021) Drug-related problems among patients with infectious disease admitted to medical wards of Wollega University Referral Hospital: Prospective observational study. SAGE Open Med 9: 1-8. https://doi.org/10.1177/2050312121989625

GOLD (2022) 2022 Global Strategy for Prevention, Diagnosis and Management of COPD, 1-165.

Gosden T, Forland F, Kristiansen IS, Sutton M, Leese B, Giuffrida A, Pedersen L (2001) Impact of payment method on behavior of primary care physicians: A systematic review. J Health Serv Res Policy 6(1): 44-55. https://doi.org/10.1258/1355819011927198

Government (2020) [Decree No. 131/2020/ND-CP providing for clinical pharmacology organization and activities in healthcare establishments dated November 02, 2020]. https://thuvienphapluat.vn/van-ban/The-thao-Y-te/Nghi-dinh-131-2020-ND-CP-to-chuc-hoat-dong-duoc-lam-sang-cua-co-so-kham-benh-chua-benh-456678.aspx [Consulted May 19, 2023].

Hopkins RE, Bui T, Magliano D, Arnold C, Dooley M (2019) Prescriber education interventions to optimize opioid prescribing in acute care: A systematic. Pain Physician 22: 551-562. https://pubmed.ncbi.nlm.nih.gov/31775401/

Horák P, Underhill J, Batista A, Amann S, Gibbons N (2018) EAHP European statements survey 2017, focusing on sections 2 (selection, procurement and distribution), 5 (patient safety and quality assurance) and 6 (education and research). European Journal of Hospital Pharmacy, 25(5): 237-244. https://doi.org/10.1136/ejhpharm-2018-001659

Huynh DTM, Luong CL, Vo QLD, Tran BK, De Tran V (2023) Assessment of the results of clinical pharmacists' interventions on the use of antibiotics at a medical center in Vietnam between 2021 and 2022. J Pharm Pharmacogn Res 11(5): 787-796. https://doi.org/10.56499/jppres23.1663_11.5.787

Huynh HT, Nguyen TTH, Dang TNN, Nguyen TB (2012) The effectiveness of electronic prescribing solutions in drug use management. Vietnam J Online 52(11): 1-8. https://vjol.info.vn/index.php/tcdh/article/view/13784

Leonard C, Stordeur S, Roberfroid D (2009) Association between physician density and health care consumption: A systematic review of the evidence. Health Policy 91(2): 121-134. https://doi.org/10.1016/j.healthpol.2008.11.013

Leppien EE, Demler TL, Trigoboff E (2019) Exploring the effectiveness of team-based enablement interventions to improve antibiotic prescribing within a psychiatric hospital. Innov Clin Neurosci 16(5-6): 22-29. https://pubmed.ncbi.nlm.nih.gov/31440398/

Meng H, Zhao YQ, Fu H, Qiao X (2020) Near-optimal individualized treatment recommendations. J Mach Learn Res 21(1): 7475-7502. https://pubmed.ncbi.nlm.nih.gov/34335111/

Merino-Castelló A (2003) Demand for pharmaceutical drugs: a choice modeling experiment. UPF Economics and Business Working Paper No. 704, pp. 1-46. http://dx.doi.org/10.2139/ssrn.562962

Ministry of Health (2015) [Guidelines for diagnosis and treatment of dermatological diseases Issued together with Decision No. 75/QD-BYT dated January 13, 2015]. https://kcb.vn/upload/2005611/20210723/Huong-dan-chan-doan-dieu-tri-Da-lieu.pdf [Consulted May 23, 2023].

Ministry of Health (2016) [Guidelines for diagnosis and treatment of musculoskeletal diseases Issued together with Decision No. 361/QD-BYT dated January 25, 2014]. https://kcb.vn/upload/2005611/20210723//HD%C4%90T-C%C6%A1-X%C6%B0%C6%A1ng-Kh%E1%BB%9Bp.pdf [Consulted May 25, 2023].

Ministry of Health (2017) [Circular No. 52/2017/TT-BYT Providing for prescription of modern drugs and biologicals in outpatient treatment dated December 29, 2017]. https://thuvienphapluat.vn/van-ban/The-thao-Y-te/Circular-52-2017-TT-BYT-prescription-of-modern-drugs-and-biologicals-in-outpatient-treatment-374934.aspx [Consulted May 26, 2023].

Ministry of Health (2018a) [Circular No. 18/2018/TT-BYT amending and supplementing a number of articles of Circular No. 52/2017/TT-BYT dated December 29, 2017 regulating prescriptions and prescribing pharmaceutical chemicals and biological products in outpatient treatment Resident dated August 22, 2018]. https://luatvietnam.vn/y-te/thong-tu-18-2018-tt-byt-sua-doi-thong-tu-52-2017-tt-byt-ve-don-thuoc-trong-dieu-tri-ngoai-tru-166410-d1.html [Consulted May 23, 2023].

Ministry of Health (2018b) National Pharmacopoeia of Vietnam, 2nd edn. Hanoi: Medical Publishing House.

Ministry of Health (2021) [Circular No. 27/2021/TT-BYT dated December 20, 2021 of the minister of health of Vietnam on electronic prescription]. https://luatvietnam.vn/y-te/thong-tu-27-2021-tt-byt-bo-y-te-214399-d1.html [Consulted May 23, 2023].

Ministry of Health (2022) [Circular No. 04/2022/ TT-BYT circular amendments to some articles of circular No. 52/2017/TT-BYT dated December 29, 2017 and circular No. 18/2018/TT-BYT dated August 22, 2018 of the minister of health of Vietnam which amends some articles of circular No. 52/2017/TT-BYT on prescription of modern drugs and biologicals in outpatient treatment and circular no. 27/2021/TT-BYT dated December 20, 2021 of the minister of health of Vietnam on electronic prescription]. https://luatvietnam.vn/y-te/thong-tu-04-2022-tt-byt-225827-d1.html [Consulted May 23, 2023].

Ministry of Health Portal (2020) [Warning about corticosteroid abuse]. https://moh.gov.vn/chuong-trinh-muc-tieu-quoc-gia/-/asset_publisher/7ng11fEWgASC/content/canh-bao-tinh-trang-lam-dung-corticoid [Consulted Octorber 27, 2020].

Mohamadloo A, Ramezankhani A, Zarein-Dolab S, Salamzadeh J, Mohamadloo F (2017) A systematic review of main factors leading to irrational prescription of medicine. Iran J Psychiatry Behav Sci 11(2): e10242. https://doi.org/10.5812/ijpbs.10242

Ofori-Asenso R, Agyeman AA (2016) Irrational use of medicines—a summary of key concepts. Pharmacy 4(4): 35. https://doi.org/10.3390/pharmacy4040035

Onatade R, Appiah S, Stephens M, Garelick H (2018) Evidence for the outcomes and impact of clinical pharmacy: context of UK hospital pharmacy practice. Eur J Hosp Pharm 25(e1): e21-e28. https://doi.org/10.1136/ejhpharm-2017-001303

Porterfield A, Engelbert K, Coustasse A (2014) Electronic prescribing: improving the efficiency and accuracy of prescribing in the ambulatory care setting. Perspect Health Inf Mana 11(Spring): 1-13. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3995494/

Ramamoorthy S, Cidlowski JA (2016) Corticosteroids: Mechanisms of action in health and disease. Rheum Dis Clin North Am 42(1): 15-31.

Rathod SS, Motghare VM, Deshmukh VS, Deshpande RP, Bhamare CG, Patil JR (2013) Prescribing of topical corticosteroids in the practices of outpatient dermatology department of a rural tertiary care teaching hospital. Indian J Dermatol 58(5): 342-345. https://doi.org/10.4103/0019-5154.117293

Schäcke H, Döcke WD, Asadullah K (2002) Mechanisms involved in the side effects of glucocorticoids. Pharmacol Ther 96(1): 23-43. https://doi.org/10.1016/s0163-7258(02)00297-8

Tan T, Chan S, Ind M, Pace G, Bailey J, Reed K, Wong KC (2023) Benefits and challenges of electronic prescribing for general practitioners and pharmacists in regional Australia. Aust J Rural Health 31: 776-781. https://doi.org/10.1111/ajr.12999

Tran HA, Pham TS (2021) The prescriptions of corticoids use for outpatient treatment and related factors at Tien Giang central general hospital in 2020-2021. Can Tho J Med Pharm (Vietnam), 42: 116-123.

World Medical Association (2020) Declaration of Helsinki: Medical Research Involving Human Subjects. https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/ [Consulted August 22, 2020].

Yasir M, Goyal A, Sonthalia S (2018) Corticosteroid adverse effects. StatPearls Publishing

Yousefi N, Majdzadeh R, Valadkhani M, Nedjat S, Mohammadi H (2012) Reasons for physicians' tends to distort prescription of corticosteroids. Iran Red Crescent Med J 14(11): 713-718.

AUTHOR CONTRIBUTION:

Contribution	Huynh DTM	Nguyen D	Vo QLD	Tran VD
Concepts or ideas	x	x		
Design	x	x		
Definition of intellectual content	x			
Literature search	x	x		
Experimental studies	x	x		
Data acquisition	x	x		
Data analysis	x	x	x	
Statistical analysis	x	x	x	x
Manuscript preparation	x		x	x
Manuscript editing	x	x	x	x
Manuscript review	x	x	x	x

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