ORIGINAL RESEARCH ARTICLES

How vets prescribe: a look at small animal practices in Colombia

Cómo prescriben los veterinarios: una mirada a las prácticas en pequeños animales en Colombia

Como os veterinários prescrevem: uma visão sobre as práticas em animais de pequeno porte na Colômbia

Juan-Gonzalo Restrepo-Salazar* ⓘ; Nathalia M. Correa-Valencia ⓘ

Universidad de Antioquia, Faculty of Agricultural Sciences, School of Veterinary Medicine, CENTAURO Research Group, Medellín, Colombia.

Abstract

Background: Medical prescriptions are fundamental to ensuring the rational and safe use of medications. In veterinary medicine, they play a critical role in therapeutic decision-making and patient safety. However, limited evidence exists regarding how veterinarians in Colombia complete and issue prescriptions for companion animals. Although national regulations provide clear requirements, there is little information on compliance within clinical settings. **Objective:** To describe and analyze how veterinary professionals prescribe treatments in their everyday practices, assessing adherence to the standards set by national regulations. Furthermore, our study intends to identify potential errors, inconsistencies, or practices that could impact patient health and the effectiveness of treatments. **Methods:** Data were collected retrospectively from electronically generated prescriptions at a veterinary hospital for small animals in a university setting in Medellín (Colombia) in 2022. Compliance with national regulations required prescriptions to include specific information such as the veterinarian's details, patient identification, medication specifics, and clear instructions, all presented legibly in Spanish. Descriptive statistics were calculated for all variables of interest. **Results:** A total of 1,152 prescriptions were analyzed, resulting in 3,432 substances, of which 3,108 unique entries remained after eliminating 324 duplicates. Among these, 3,106 were classified as medications. The analysis revealed significant issues in prescription practices, with 9,559 instances of incorrect reporting of prescription components, 450 cases of invalid abbreviations, and 632 instances of invalid information. The most common errors included unclear indications (78.38%), absence of quantity (in number) (73.75%), and undefined pharmaceutical forms (58.04%). **Conclusion:** This study enhances veterinary practices and proposes training strategies to ensure compliance with regulations. It is vital for hospitals' role in training veterinary students, influencing their future decisions and public health. The goal is to promote rational medication use for companion animals, improve animal welfare, and strengthen veterinary medicine in Colombia.

Resumen

Antecedentes: Las prescripciones médicas son esenciales en la atención clínica, asegurando el uso adecuado de medicamentos para los pacientes. En la medicina veterinaria, son cruciales para el tratamiento de animales de compañía; sin embargo, la correcta finalización y aplicación de estas prescripciones no han sido estudiadas de manera sistemática en Colombia. A pesar de las claras regulaciones nacionales, existe una falta de investigación sobre las prácticas de los veterinarios en la emisión de prescripciones médicas para mascotas, lo que resalta la necesidad de mejorar la capacitación y la adherencia a los estándares. **Objetivo:** Describir y analizar cómo los profesionales veterinarios prescriben tratamientos en sus prácticas cotidianas, evaluando la adherencia a los estándares establecidos por las regulaciones nacionales. Además, nuestro estudio tiene como objetivo identificar posibles errores, inconsistencias o prácticas que podrían afectar la salud del paciente y la efectividad de los tratamientos. **Métodos:** Se recopilaron datos retrospectivamente de prescripciones generadas electrónicamente en un hospital veterinario para pequeños animales en un entorno universitario en Medellín (Colombia) en 2022. El cumplimiento de las regulaciones nacionales requería que las prescripciones incluyeran información específica, como los datos del veterinario, la identificación del paciente, los detalles del medicamento y las instrucciones claras, todo presentado de manera legible en español. Se calcularon estadísticas descriptivas para todas las variables de interés. **Resultados:** Se analizaron un total de 1.152 prescripciones, resultando en 3.432 sustancias, de las cuales 3.108 entradas únicas permanecieron después de eliminar 324 duplicados. De estas, 3.106 fueron clasificadas como medicamentos. El análisis reveló problemas significativos en las prácticas de prescripción, con 9.559 casos de informes incorrectos de los componentes de la prescripción, 450 casos de abreviaturas inválidas y 632 instancias de información inválida. Los errores más comunes incluyeron indicaciones poco claras (78,38%), ausencia de cantidad (en número) (73,75%) y formas farmacéuticas no definidas (58,04%). **Conclusión:** Este estudio mejora las prácticas veterinarias y propone estrategias de capacitación para asegurar el cumplimiento de las regulaciones. Es vital para el papel de los hospitales en la formación de estudiantes de veterinaria, influyendo en sus futuras decisiones y en la salud pública.

El objetivo es promover el uso racional de medicamentos para animales de compañía, mejorar el bienestar animal y fortalecer la medicina veterinaria en Colombia.

Resumo

Antecedentes: As prescrições médicas são essenciais na atenção clínica, garantindo o uso adequado de medicamentos para os pacientes. Na medicina veterinária, são cruciais para o tratamento de animais de companhia; no entanto, a correta finalização e aplicação dessas prescrições não foram estudadas de maneira sistemática na Colômbia. Apesar das claras regulamentações nacionais, existe uma falta de pesquisa sobre as práticas dos veterinários na emissão de prescrições médicas para animais de estimação, o que ressalta a necessidade de melhorar a capacitação e a adesão aos padrões. **Objetivo:** Descrever e analisar como os profissionais veterinários prescrevem tratamentos em suas práticas cotidianas, avaliando a adesão aos padrões estabelecidos pelas regulamentações nacionais. Além disso, nosso estudo tem como objetivo identificar possíveis erros, inconsistências ou práticas que poderiam afetar a saúde do paciente e a eficácia dos tratamentos. **Métodos:** Foram coletados dados retrospectivamente de prescrições geradas eletronicamente em um hospital veterinário para pequenos animais em um ambiente universitário em Medellín (Colômbia) em 2022. O cumprimento das regulamentações nacionais exigia que as prescrições incluíssem informações específicas, como os dados do veterinário, a identificação do paciente, os detalhes do medicamento e instruções claras, tudo apresentado de maneira legível em espanhol. Foram calculadas estatísticas descritivas para todas as variáveis de interesse. **Resultados:** Um total de 1.152 prescrições foi analisado, resultando em 3.432 substâncias, das quais 3.108 entradas únicas permaneceram após a eliminação de 324 duplicatas. Destas, 3.106 foram classificadas como medicamentos. A análise revelou problemas significativos nas práticas de prescrição, com 9.559 casos de relatórios incorretos dos componentes da prescrição, 450 casos de abreviações inválidas e 632 instâncias de informações inválidas. Os erros mais comuns incluíram indicações pouco claras (78,38%), ausência de quantidade (em

número) (73,75%) e formas farmacêuticas não definidas (58,04%). **Conclusão:** Este estudo melhora as práticas veterinárias e propõe estratégias de capacitação para garantir o cumprimento das regulamentações. É vital para o papel dos hospitais na formação de estudantes de veterinária, influenciando suas futuras decisões e a saúde pública. O objetivo é promover o uso racional de medicamentos para animais de companhia, melhorar o bem-estar animal e fortalecer a medicina veterinária na Colômbia.

Introduction

Medical prescriptions are a fundamental tool in clinical care, as they ensure patients' appropriate and rational use of medications. According to the World Health Organization (WHO), rational medication use requires that patients receive medications that align with their clinical needs, in doses that meet individual requirements, for a sufficient duration, and at the lowest possible cost to both themselves and their community (WHO, 2002). In veterinary medicine, prescriptions play a crucial role in the effective treatment of animals, contributing to the well-being of species such as dogs and cats, which represent the largest population of companion animals in Colombia. However, despite their importance, the accurate preparation and issuance of medical prescriptions in veterinary practices have not always been the subject of systematic studies in the country.

Colombia's national regulations, established under Decree 780 of 2016 (the single regulatory decree of the health and social protection sector), define a medical prescription's parameters (Chapter V) and stipulate that all must include precise and detailed information, such as the identification of the prescribing professional, the patient, the pharmaceutical form, the dosage to be administered, the frequency, the duration of treatment, and the route of administration. These provisions aim to standardize and regulate how healthcare professionals, including veterinarians, issue prescriptions, minimize errors, and ensure the safety and effectiveness of treatments.

Globally, various studies have reported inconsistent prescribing practices in veterinary medicine, such as the irrational use of medications, errors in the frequency of administration, or inappropriate dosages. For example, a study by Mateus *et al.* (2011) highlighted that antimicrobial overprescription and inappropriate dosage are common challenges in small animal veterinary practices, contributing to issues such as antimicrobial resistance and compromised treatment outcomes. These deficiencies may be attributed to a lack of specialized training in veterinary clinical pharmacology, the absence of control and monitoring systems, or the ineffective implementation of existing regulations. For example, studies such as those by Hardefeldt *et al.* (2017) emphasize the need for improved veterinary pharmacology education and highlight that insufficient training contributes to inappropriate prescribing behaviors, particularly in small animal practices.

In Colombia, although the regulatory framework is clear, there is a gap in studies describing how veterinarians complete medical prescriptions, particularly for companion animals such as dogs and cats. This article aims to describe and analyze how veterinary professionals prescribe treatments in their daily practices, evaluating compliance with the parameters established by national regulations. Additionally, it seeks to identify possible errors, inconsistencies, or practices that may affect patient health and treatment efficacy.

Materials and methods

Ethical considerations
No animals were handled or subjected to any interventions during this study, as the data analyzed originated from routine veterinary consultations. Consequently, approval from an ethical committee for animal experimentation was not needed.

Data collection
Retrospective data on electronically generated prescriptions at a veterinary hospital for small animals in a university setting in Medellín, Colombia, were collected from January 1st–December 31, 2022.

Compliance with the content of the prescription

According to Colombia's national regulations, which were established under Decree 780 of 2016, a medical prescription must include, at a minimum, the following information, where applicable: 1. The name, address, and contact information (phone number or email) of the veterinary healthcare provider or prescribing professional; 2. The place and date of the prescription; 3. Patient's name and identification document of the pet owner; and 4. The medical record number. It should also specify the name of the medication using the International Nonproprietary Name (INN) or generic name, along with its concentration and pharmaceutical form. Details such as the route of administration, dosage, frequency, and duration of treatment must be clearly outlined. Additionally, the total quantity of pharmaceutical units required for the treatment should be expressed in both numbers and words. Any specific instructions the prescriber deems necessary must be included, as well as the prescription's validity. Finally, the format must include the name and signature of the prescriber, along with their professional registration number (professional license number issued by COMVEZCOL, in the Colombian case).

The prescription must be written clearly and legibly, including all necessary instructions for administration, and prepared in Spanish and presented in physical form, whether typewritten, through electronic media, or via computerized systems. The prescription must not contain amendments, erasures, acronyms, codes, secret symbols, abbreviations, or chemical symbols. This approach should allow for verification between the prescribed medication and the dispensed medication, as well as ensure correlation between the prescribed medications and the diagnosis. The dosage for each medication must be expressed in the metric decimal system and, in specific cases, in international units. For magistral (i.e., a pharmaceutical preparation or product made by a pharmacist to fulfill a medical prescription for an individual patient, requiring some form of technical intervention of varying complexity) or extemporaneous drug formulation preparations (i.e., a medication prepared at the time of dispensing, typically to address the immediate needs of a patient, although it is not necessarily personalized and is commonly used when a commercially available medication is not accessible in the required form or presentation) (Colombian Decree 2200 of 2005), in addition to meeting the general prescription requirements, each component and its corresponding quantity must be clearly specified. Examples of prescriptions considering all

legal aspects are available in the original language (Spanish) upon request to the corresponding author.

Data analysis

All the collected data were entered into Stata 18.0 (StataCorp, 2023, College Station, Texas, USA) for descriptive statistical analysis of all the variables of interest.

Results

A total of 1,152 prescriptions were analyzed, encompassing 3,432 substances (i.e., medications, nutraceuticals, phytotherapeutics, homeopathics, and symbiotics). After identifying and removing 324 duplicated entries by patient, the dataset was refined to 3,108 unique substances. Of these, 3,106 were classified as medications, which are substances utilized for medical treatment. Specifically, these are drugs that are prescribed or administered to patients for the diagnosis, treatment, or prevention of diseases and health conditions in both humans and animals. Medications can exist in various forms, including tablets, capsules, and solutions (parenteral, enteral, or topical), and are designed to exert a therapeutic effect on the body. The frequencies of incorrect reporting of the prescription components (9,559 cases), invalid abbreviations (450 cases), and invalid information (632 cases) are presented in Tables 1, 2, and 3, respectively.

Table 1. Frequency of incorrect reporting of the components of the veterinary medical prescription, according to Colombian regulations (2022).

Prescription components	Registers (n)	% out of the total of medications
Indications are not clear or lack of information	2,436	78.38
Quantity (in numbers) is not included	2,292	73.75
Pharmaceutical form is not defined	1,804	58.04
Does not report active ingredient concentration	1,277	41.09
INN not reported	909	29.25
Dosage is not clear or absent	474	15.25
The duration of the treatment is not specified	184	5.92

Presentation is not included*	62	1.99
The route of administration is not defined	49	1.58
Frequency of administration is not defined	31	1.00
Pharmaceutical form, concentration, and presentation are not defined	26	0.84
Quantity (in words) is not included	11	0.35
Quantities (in numbers and words) are not included	4	0.13
Prescription validity is not reported**	0	0.00
Total	9,559	-

INN: International Nonproprietary Name

* For example: bottle, blister pack, box.

**Refers to the state of being effective or applicable at a given time, indicating that they are currently in force and enforceable.

Table 2. Frequency of invalid abbreviations registered in veterinary medical prescriptions, according to Colombian regulations (2022).

Abbreviations (correct way in Spanish)	Registers (n)	% out of the total of medications
ml (mililitros)	347	11.16
hs (horas)	48	1.54
mns/min (minuto(s))	26	0.84
tab (tableta)	13	0.42
sc (subcutáneo)	7	0.23
gr (gramos)	6	0.19
seg (segundos)	2	0.06
cmts (centímetros)	1	0.03
Total	450	-

Table 3. Frequency of invalid information registered in veterinary medical prescriptions. according to Colombian regulations (2022).

Items	Registers (n)	% out of the total of medications
Prescribes less than what is indicated (does not correspond)	191	6.15
centimeter(s)*	150	4.83
Not a pharmaceutical form	116	3.73
The prescription includes two products in one item line	40	1.29
Prescribes more than what is indicated (does not correspond)	39	1.25
Erratic administration**	31	1.00

The pharmaceutical form does not exist	19	0.61
Extemporaneous administration registered as magistral***	14	0.45
1/8 tablet	9	0.29
mg/kg	8	0.84
mg/m^2	4	0.13
The combination of active ingredients is not available on the market	4	0.13
The prescription includes three products in one item line	3	0.10
1/3 tablet****	2	0.06
1/2 drop	1	0.03
2/3 tablet****	1	0.03
Total	632	-

*Should be in milliliters.

**For example, a vaginal ovule to be administered rectally or something designed to be administered orally applied topically.

*** Extemporaneous refers to the process of preparing and dispensing a medication that is not commercially available and is made specifically for an individual patient. This type of preparation is often tailored to meet the unique needs of the patient on the basis of a prescription from a healthcare provider. The term magistral indicates that the preparation is made according to specific instructions or formulas, often in a pharmacy setting, ensuring that the medication is customized and safe for the patient's use.

****Only applies when the tablet has grooves (not the case).

Discussion

This study provides a detailed analysis of prescription practices in small animal veterinary medicine within a university hospital setting in Colombia, assessing compliance with national legal requirements. The results highlight substantial deficiencies in prescription completeness and accuracy, emphasizing the ongoing need for professional development in pharmacology and regulatory adherence.

Similar to human medicine (Reason, 2000), prescription errors in veterinary practice are increasingly recognized as significant contributors to adverse therapeutic outcomes and compromised patient safety (Medication errors — RCVS inFOCUS, 2022: https://infocus.rcvsknowledge.org/revp-medication-errors/). Several studies in veterinary settings have documented high frequencies of errors related to incomplete documentation (e.g., omitted

weight), unclear dosage instructions, and inconsistent adherence to prescription-standards (FDA, 2024; Pinho et al., 2024; Petrou et al., 2025). Strengthening veterinary pharmacology education and implementing standardized monitoring mechanisms are essential to improve prescribing quality and ensure rational drug use.

The delivery of optimal pharmaceutical care to veterinary patients is crucial. This need is heightened by the reality that veterinary-specific products —which are not indicated for human use, necessitate specialized manufacturing facilities and a new animal drug application process to obtain marketing approval. Nevertheless, when a veterinarian issues an exceptional prescription (i.e., extemporaneous or magistral drug formulations), they assume direct responsibility for any potential failures in the performance of the prescribed medication, including its therapeutic efficacy and overall safety. This encompasses the occurrence of any adverse or undesired effects in the patient, which falls under the veterinarian's accountability, unlike in the case of ordinary prescriptions. Therefore, the veterinarian takes on an additional level of responsibility. In all cases, the veterinarian prescribing a medication is required to issue the corresponding prescription, and this document must follow a specific structure. Although this was observed in only a few cases during 2022 in the student setting (0.45%), it is something that should be monitored to understand any potential trends or changes that may arise over time, especially in educational environments where various factors can influence student experiences and outcomes. By keeping track of such occurrences, educators and administrators can take proactive measures to address any emerging issues and ensure a supportive learning atmosphere.

Off-label prescription refers to a practice where a veterinarian prescribes a medication for a purpose that has not been officially approved by regulatory authorities. It is important to differentiate off-label prescriptions from exceptional prescriptions, which may arise due to therapeutic gaps or the cascade system. In the context of our study, several situations related to off-label use were observed, highlighting its prevalence and the complexities surrounding its application. Off-label prescriptions can involve instances where veterinarians deviate from the authorized dosage or the approved route of administration on the basis of their clinical judgment and experience. In Colombia, off-label prescriptions are not officially authorized in either human or veterinary clinical settings. This lack of authorization raises important ethical and legal considerations for

veterinarians, as they navigate the challenges of providing effective treatment while adhering to regulatory guidelines. As such, the implications of off-label use warrant careful monitoring and further research to ensure the safety and efficacy of veterinary care.

The importance of issuing complete veterinary prescriptions in compliance with legal regulations lies in ensuring safe, effective, and responsible clinical practice for patients and their caregivers while protecting public health. Veterinary prescriptions are not only a fundamental tool for therapeutic communication but also a legal requirement in many countries. Noncompliance can lead to serious consequences, such as risks to animal and human health (WHO, 2015), including the development of antimicrobial resistance or adverse reactions. Furthermore, noncompliance may result in legal liability, exposing veterinary professionals to administrative, legal, or even criminal penalties. It also undermines the caregiver's trust in the veterinarian, which can damage the client-veterinarian relationship and harm the practitioner's professional reputation.

It is also suggested that the prescription should include the commercial name recommended by the prescriber, along with the INN, even if national regulations do not require it. This practice is beneficial for several reasons. Although the INN serves as a standardized identifier for the active ingredient recognized globally, which helps healthcare professionals communicate effectively about medications, including the commercial name, can help ensure that the pharmacist dispenses the exact medication intended by the prescriber, which is particularly important in cases where multiple brands may contain the same active ingredient but differ in formulation or dosage. This clarity reduces the risk of medication errors and enhances patient safety. Therefore, by providing both the commercial name and the INN, prescribers can facilitate a clearer understanding of the medication being prescribed, ensuring that patients receive the appropriate treatment. Furthermore, even though national regulations may not mandate this practice, adhering to it can improve the overall quality of care. These findings demonstrate a commitment to patient safety and effective communication among healthcare providers, pharmacists, and patients. This approach can ultimately lead to better health outcomes and a more efficient healthcare system.

To ensure effective and responsible veterinary care, several measures can be implemented to improve clinical practices. First, continuous training and education should be provided, keeping

veterinary professionals updated on pharmacology, legal regulations, and best clinical practices. Such training ensures that veterinarians are well equipped to address evolving challenges in their field; second, the adoption of prescription management digital systems, such as prescription observatories, can streamline the recording, monitoring, and analysis of veterinary prescriptions. These tools assist in pinpointing areas that need enhancement, guaranteeing adherence to regulations, and sustaining a dependable database for continuous quality control. Third, they highlight nonpharmacological recommendations as integral components of treatment plans. Communicating these measures clearly prevents pet caregivers from perceiving them as secondary. Recommendations may include tailored instructions on diet, exercise, environmental adjustments, and other preventive strategies that support overall animal health and well-being; and fourth, clear, comprehensive, and meticulously detailed prescription writing to avoid miscommunication and ensure proper treatment. Essential elements include the generic and brand name of the medication, pharmaceutical form, concentration, and presentation; a clear indication; dosage; route of administration; treatment duration; and relevant warnings regarding potential adverse effects and safety precautions. By adopting these practices, veterinary professionals can enhance the quality and consistency of care, improving client relationships, and uphold their responsibilities toward animal and public health.

This study represents a relevant contribution to improving veterinary clinical practices and developing training and control strategies that ensure compliance with current legislation. In addition, these findings are especially important considering that veterinary hospitals in university settings function as training facilities for both veterinary medicine and veterinary assistance students. The prescribing practices observed here not only influence students' future professional decision-making but also carry broader public health implications. By keeping track of such occurrences, it aims to promote the rational use of medications in the care of companion animals, contributing to animal welfare and strengthening veterinary medicine in Colombia.

As limitations of the study, it was conducted in a university veterinary hospital, where prescriptions may occasionally be issued by final-year veterinary students or veterinary assistants under the direct supervision and authorization of licensed veterinarians. This academic context may introduce minor variations or documentation errors inherent to the teaching process. Additionally,

the analysis was limited to a single institution in Medellín, which may not fully reflect prescription practices across private clinics or other veterinary settings in Colombia. However, these findings provide an essential initial framework for understanding how prescription standards are applied in companion animal medicine.

Declarations

Author contributions

Juan Gonzalo Restrepo-Salazar: Conceptualization. Investigation. Data curation. Writing - review & editing. Nathalia M Correa Valencia: Data curation. Writing – original draft. Writing - review & editing.

Use of artificial intelligence (AI)

During the preparation of this work the authors used OpenAI ChatGPT (October 2023 version. https://chat.openai.com/) to improve the readability and language of the manuscript. After using this tool. the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Data availability

The data sets used in the current study are available from the corresponding author on request.

References

Decree 2200 of 2005, Ministry of Health and Social Protection of Colombia. https://www.funcionpublica.gov.co/eva/gestornormativo/norma.php?i=16944

Decree 780 of 2016, Ministry of Health and Social Protection of Colombia https://www.funcionpublica.gov.co/eva/gestornormativo/norma.php?i=77813

Food and Drug Administration (FDA). Veterinary Medication Errors [Internet]. 2024. https://www.fda.gov/animal-veterinary/product-safety-information/veterinary-medication-errors

Hardefeldt LY, Holloway S, Trott DJ, Shipstone M, Barrs VR, Malik R, Burrows M, Armstrong S, Browning GF, Stevenson M. Antimicrobial prescribing in dogs and cats in Australia: results of the Australasian Infectious Disease Advisory Panel survey. J Vet Intern Med. 2017; 31(4):1100–1107. http://doi.org/10.1111/jvim.14733

Mateus A, Brodbelt DC, Barber N, Stärk KDC. Antimicrobial usage in dogs and cats in first opinion veterinary practices in the UK. J Small Anim Pract. 2011; 52(10):515–521. http://doi.org/10.1111/j.1748-5827.2011.01098.x

Petrou E, Davies H, Aoun M, Radford AD, Singleton D, Noble PM, Killick DR. First opinion practice electronic health records are a useful source of descriptions of medication errors. Front Vet Sci. 2025; 12:1560652. http://doi.org/10.3389/fvets.2025.1560652

Pinho RH, Nasr-Esfahani M, Pang DSJ. Medication errors in veterinary anesthesia: a literature review. Vet Anaesth Analg. 2024; 51(3):203–226. http://doi.org/10.1016/j.vaa.2024.01.003

Reason J. Human error: models and management. BMJ 2000; 320(7237):768–770. http://doi.org/10.1136/bmj.320.7237.768

World Health Organization (WHO). Promoting rational use of medicines: core components. WHO Policy Perspectives on Medicines. No. 5. Geneva. 2002. https://iris.who.int/bitstream/handle/10665/67438/WHO_EDM_2002.3.pdf

World Health Organization (WHO). Global action plan on antimicrobial resistance. Geneva. 2015. https://www.who.int/publications/i/item/9789241509763