

High Prevalence of Banned Drug Sales on Chinese E-commerce Platforms: The First Empirical Assessment of NMPA's Banned List Compliance

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High Prevalence of Banned Drug Sales on Chinese E-commerce Platforms: The First Empirical Assessment of NMPA's Banned List Compliance

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Abstract

Background: Since 2019, the online sales of prescription drugs in China have gradually been lifted of restrictions, and the risk of drug abuse has attracted regulatory attention.

Objective: To prevent such risks, the National Medical Products Administration (NMPA) issued the "Banned List of Drugs for Online Sales (First Edition)" in 2022, which clearly stipulates the scope of drugs prohibited for online sale. This study aims to investigate the compliance status of Chinese e-commerce platforms with this list.

Methods: We selected 43 banned drugs from the "Banned List of Drugs for Online Sales (First Edition)" as research samples. We conducted searches on four e-commerce platforms: Taobao, JD.com, Meituan, and Ele.me, and used descriptive statistical methods to analyze the current sales status and purchase process of the banned drugs. Additionally, we employed chi-square testing to compare the differences in the sales of banned drugs across the four platforms.

Results: Overall, 58.1% of banned drugs can be purchased on the four platforms. In terms of the types of banned drugs for sale, antiepileptic drugs, antithrombotic drugs, and antifungal drugs are all on sale, 80% of antibiotics are on sale, and half of cardiovascular system drugs are on sale. The sales rates of the four platforms, from high to low, are as follows: Ele.me 53.5%, JD.com 51.2%, Taobao 48.8%, and Meituan 44.2%. There are violations in the sales process. The Pearson chi square value is 0.814, indicating that the differences between the relevant variables have not reached a statistically significant level.

Conclusions: Although the "Banned List of Drugs for Online Sales (First Edition)" has clearly defined the scope of banned prescription drugs, there are significant deficiencies in the compliance of e-commerce platforms. Therefore, Chinese regulatory authorities need to further strengthen supervision to ensure the safety of public medication.

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Original Manuscript

High Prevalence of Banned Drug Sales on Chinese E-commerce Platforms: The First Empirical Assessment of NMPA's Banned List Compliance

Highlights

- We are the first in the world to conduct an empirical study on the current status of violations involving the online sale of banned drugs within China.
- We have found that the situation of online sales of banned drugs in China is quite severe, with a cumulative 58.1% of banned drugs being available for purchase.
- We found that there was no significant difference in the sale of banned drugs across various platforms, and violations were widespread.

Abstract

Objectives

Since 2019, the online sales of prescription drugs in China have gradually been lifted of restrictions, and the risk of drug abuse has attracted regulatory attention. To prevent such risks, the National Medical Products Administration (NMPA) issued the "*Banned List of Drugs for Online Sales (First Edition)*" in 2022, which clearly stipulates the scope of drugs prohibited for online sale. This study aims to investigate the compliance status of Chinese e-commerce platforms with this list.

Methods

We selected 43 banned drugs from the "*Banned List of Drugs for Online Sales (First Edition)*" as research samples. We conducted searches on four e-commerce platforms: Taobao, JD.com, Meituan, and Ele.me, and used descriptive statistical methods to analyze the current sales status and purchase process of the banned drugs. Additionally, we employed chi-square testing to compare the differences in the sales of banned drugs across the four platforms.

Results

Overall, 58.1% of banned drugs can be purchased on the four platforms. In terms of the types of banned drugs for sale, antiepileptic drugs, antithrombotic drugs, and antifungal drugs are all on sale, 80% of antibiotics are on sale, and half of cardiovascular system drugs are on sale. The sales rates of the four platforms, from high to low, are as follows: Ele.me 53.5%, JD.com 51.2%, Taobao 48.8%, and Meituan 44.2%. There are violations in the sales process. The Pearson chi square value is 0.814, indicating that the differences between the relevant variables have not reached a statistically significant level.

Conclusion

Although the "*Banned List of Drugs for Online Sales (First Edition)*" has clearly defined the scope of banned prescription drugs, there are significant deficiencies in the compliance of e-commerce platforms. Therefore, Chinese regulatory authorities need to further strengthen supervision to ensure the safety of public medication.

Keywords

Banned list; Online pharmacy; Prescribed medication; Medication safety.

1. Introduction

In recent years, online sales of prescription drugs have become one of the important driving forces for the development of the global pharmaceutical industry[1]. An increasing number of patients and consumers are inclined to purchase prescription drugs through online channels[2,3]. Although online sales of prescription drugs have significantly improved the convenience and accessibility of obtaining prescription drugs[4–6], they also potentially increase the risk of drug abuse[7–9]. To ensure the rationality and safety of public medication, the National Medical Products Administration (NMPA) has organized the development of the "*Banned List of Drugs for Online Sales (First Edition)*"[10], which clarifies the scope of prescription drugs prohibited from being sold online.

The existing research on quantitative analysis of online sales of prescription drugs is still weak, and its research content mainly includes the manifestations of illegal behavior in online sales of

prescription drugs[11–13]; The lag problem of regulatory technology application[14]; Failure mode and effect analysis prescription drug online shopping[15]; Different groups' views on online pharmacies[16–19], etc. At the same time, there are obvious shortcomings in empirical research on drugs banned from online sales. Existing results are mostly limited to policy text analysis, and the actual implementation effect of the "*Banned List of Drugs for Online Sales (First Edition)*" urgently needs further empirical testing and systematic evaluation.

The purpose of this study is to examine the compliance of Chinese e-commerce platforms with "*Banned List of Drugs for Online Sales (First Edition)*", reveal potential risks in the current online drug sales system, and provide empirical evidence for optimizing drug online regulatory policies.

2. Methods

2.1 Sampling and data collection

The "*Banned List of Drugs for Online Sales (First Edition)*" is divided into two categories: the first category is "drugs explicitly prohibited from sale by policies and regulations", including vaccines, blood products, anesthetics, psychotropic drugs, toxic drugs for medical use, radioactive drugs, drug precursor chemicals, as well as medical institution preparations and traditional Chinese medicine formula granules; The second category is "other drugs prohibited from being sold through online retail", which includes four categories: 1. Injectable drugs; 2. Compound preparations containing ephedrine (excluding traditional Chinese patent medicines and simple preparations containing ephedrine), oral compound preparations containing narcotic drugs, oral compound preparations containing tramadol, and oral single preparations of dextromethorphan; 3. Anabolic agents and peptide hormones listed in the Catalogue of Doping Agents (excluding insulin); 4. There are a total of 43 types of drugs.

This study selected 43 drugs under the fourth category of "other drugs prohibited from online retail" in the "*Banned List of Drugs for Online Sales (First Edition)*" as research objects, mainly based on the following two reasons:

Firstly, the objectives are clear and easy to regulate. The other three categories under this category are injections, compound preparations containing special ingredients, and stimulants, which cover a wide range. Some of the product catalogs have dynamic adjustment characteristics or fuzzy boundaries. For example, the "Catalogue of Doping Agents" contains a wide variety of protein assimilation agents and peptide hormones, which requires frequent updates to the list in actual regulation. The 43 drugs in the fourth category are clearly listed as single agent preparations, with clear generic names and fixed varieties, which is more conducive to accurate identification and law enforcement operations.

Secondly, the risk of public medication use is more urgent. Although unselected banned drugs have significant harm, their clinical application scenarios are limited, and the probability of ordinary patients actively purchasing them is low; In addition, China strictly regulates the first category of drugs that are explicitly prohibited from sale by policies and regulations, and the likelihood of such drugs circulating through online channels is extremely low. In contrast, the fourth category of drugs has a higher risk of abuse under non professional guidance, and because they are more closely related to daily medication needs, the public is prone to purchasing or abusing them through online channels[20]. The direct impact of non-standard sales on public health is more common.

2.2 Data sources and collection

We conducted a systematic investigation on the online drug sales behavior of four e-commerce platforms, Taobao, JD.com, Meituan, and Ele.me. Researchers conducted searches on four platforms using keywords such as "generic name" or "generic name+dosage form" for drugs. The search time is limited to April to May 2025. Two well-trained investigators conducted an investigation from an e-

commerce platform. The investigation includes the sales situation of banned drugs, the purchasing process, and the differences in the sales of banned drugs on the four platforms. Double data extraction is used for some prescriptions to ensure the accuracy of the extraction. All data were checked for completeness by investigators.

2.3 Measurements

2.3.1 Classification of Banned Drugs

Our classification of banned drugs is coded according to the World Health Organization's (WHO) anatomical therapeutic chemicals (ATC) classification system, as recommended by the WHO Collaborating Centre for Drug Statistics Methodology.[21].

2.3.2 Definition of Sales of Banned Drugs

Based on the investigation, we define the sales of banned drugs as the actual sales status of banned drugs on four e-commerce platforms: Taobao, JD.com, Meituan, and Ele.me. Figure 1 shows the criteria for judging drug sales in this study, which is to define the sales situation based on whether the platform displays the status of drugs for sale.



Figure 1. Sales of banned drugs on JD platform.

2.3.3 Statistical analysis

We conducted a chi square test to explore whether there were significant differences in the sale of banned drugs on these four e-commerce platforms. We assume that:

Hypothesis (H0): There is no significant difference in the sales of banned drugs among the four platforms (platform types are independent of the sales of banned drugs);

Alternative hypothesis (H1): There is a significant difference in the sales of banned drugs between at least one platform and other platforms.

We use Microsoft Excel In 2019, descriptive statistics were performed on the data using SPSS Statistics software version 16 to conduct statistical analysis.

3. Result

3.1 Research Sample

We conducted a survey on the sales of 43 banned drugs on four e-commerce platforms, Taobao, JD.com, Meituan, and Ele.me, from April to May 2025. Among these banned drugs, 58.1% of them can be purchased cumulatively (Table 1). A survey shows that among the 43 banned drugs, antiepileptic drugs, antithrombotic drugs, and antifungal drugs are all on sale, 80% of antibiotics are on sale, and half of cardiovascular system drugs are on sale.

Table 1. ATC classification and cumulative sales of research samples (n=43)

DRUG	ATC code	Cumulative sales
Digoxin	C01AA05	√
Disopyramide	C01BA03	×
Quinidine	C01BA01	×
Prazosin	C02CA01	√
Procainamide	C01BA02	×
Propafenone	C01BC03	√
Amiodarone	C01BD01	√
Quinine	P01BC01	×
Aminophylline	R03DA05	√
Gallbladder theophylline	R03DA04	×
Isoproterenol	C01CA02	×
Phenytoin	N03AB02	√
Carbamazepine	N03AF01	√
Lamotrigine	N03AX09	√
Chloral Hydrate	N05CC01	×
Dabigatran etexilate	B01AE07	√
Warfarin	B01AA03	√
Ticagrelor	B01AC24	√
Cilostazol	B01AC23	√
Primidone	N03AA03	√
Lithium carbonate	N05AN01	√
Isoflurane	N01AB06	×
Sevoflurane	N01AB08	×
Enflurane	N01AB04	×
Desflurane	N01AB07	×
Colchicine	M04AC01	√
Mifepristone	G03XB01	×
mifepristone, combinations	G03XB51	×
Cyproterone	G03HA01	×
Carboprost Methylate	G02AD03	×
Estradiol	G03CA03	√
Misoprostol	A02BB01 G02AD06	×
Dinoprostone	G02AD02	×
Faropenem	J01DI03	√
Fusidic Acid	D06AX01 D09AA02 J01XC01 S0	×
Voriconazole	1AA13	√
Linezolid	J02AC03	√
Nemonoxacin	J01XX08	√
Posaconazole	J01MA22	√
Cefdinir	J02AC04	√
Itraconazole	J01DD15	√
Levornidazole	J02AC02	√
Cefpodoxime Proxetil	P01AB07	√
Total	J01DD13	25
Proportion (%)		58.1

√, On sale; ×, Not for sale.

3.2 Sales situation of banned drugs

The results show that the sales rates of the four platforms, from high to low, are as follows: Ele.me 23 (53.5%), JD.com 22 (51.2%), Taobao 21 (48.8%), and Meituan 19 (44.2%). Overall, the proportion of banned drugs sold by Ele.me and JD.com is relatively high, with Meituan having the lowest (Table 2).

Table 2. Sales of Banned Drugs On Different Platforms. (n=43)

Platform	Taobao	JD.com	Meituan	Ele.me
Drug				
Digoxin	√*	√	×	√*
Disopyramide	×	×	×	×
Quinidine	×	×	×	×
Prazosin	×	√	×	√*
Procainamide	×	×	×	×
Propafenone	√	√	√	√
Amiodarone	√	√	×	√
Quinine	×	×	×	×
Aminophylline	×	√	√	√
Gallbladder theophylline	×	×	×	×
Isoproterenol	×	×	×	×
Phenytoin	√	√	√	√*
Carbamazepine	√	√	√	√
Lamotrigine	√	√	√	√
Chloral Hydrate	×	×	×	×
Dabigatran etexilate	√	√	√	√
Warfarin	√	√	√	√
Ticagrelor	√	√	√	√
Cilostazol	√	√	√	√
Primidone	√	√	√	√
Lithium carbonate	×	√	×	√*
Isoflurane	×	×	×	×
Sevoflurane	×	×	×	×
Enflurane	×	×	×	×
Desflurane	×	×	×	×
Colchicine	√	√	×	×
Mifepristone	×	×	×	×
mifepristone, combinations	×	×	×	×
Cyproterone	×	×	×	×
Carboprost Methylate	×	×	×	×
Estradiol	√	×	√	√
Misoprostol	×	×	×	×
Dinoprostone	×	×	×	×
Faropenem	√	√	√	√
Fusidic Acid	×	×	×	×
Voriconazole	√	√	√	√
Linezolid	√	√	√	√
Nemonoxacin	√	√	√	√
Posaconazole	×	√	×	√
Cefdinir	√	×	√	√
Itraconazole	√	√	√	√
Levornidazole	√	×	×	×
Cefpodoxime Proxetil	√	√	√	√
Total	21	22	19	23
Proportion (%)	48.8	51.2	44.2	53.5

√, On sale; ×, Not for sale; *, When searching with the keyword 'generic name of drugs', no relevant banned drugs were found; When searching with the keywords "generic name of drug+dosage form", relevant banned drugs can be found.

Figure 2 shows the impact of differences in search keywords found in data retrieval on the results: when searching with "generic drug name" as the keyword, no relevant banned drugs were found; When searching with the keywords "generic name of drug+dosage form", sales information of related drugs can be obtained. Taking digoxin as an example, when the keyword "digoxin" is entered, the search results page shows no search results; When entering the keyword 'digoxin tablets', the on sale information of the drug will be displayed.



Figure 2. Search results for different keywords.

Figure 3 presents the phenomenon observed during the retrieval process in this study: some platforms inform patients and consumers through purchase service prompts that relevant drugs have been included in the "Banned List of Drugs for Online Sales (First Edition)" and therefore cannot be purchased through online channels.



Figure 3. Product details of drug appointment and purchase services on different platforms

3.3 Process of drug sales

This study found through a systematic investigation of four e-commerce platforms that their drug purchase processes mainly exhibit two modes, and there are significant differences in compliance. The first type is the compliance process, which is the "online appointment offline diagnosis and treatment" model. This model is represented by some merchants on JD.com and Taobao platforms, and its operation process complies with the requirements of the "Measures for the Supervision and Administration of Drug Network Sales". The second type is the illegal purchasing process, which is the "online consultation direct delivery" model. Ele.me and some Taobao merchants adopt this model, taking Taobao as an example: purchase drugs, prescribe and purchase drugs - add the information of the medication user (the system defaults to normal kidney and liver function of the medication user), select a confirmed disease, supplement prescription, medical records, and examination report photos - force to check "offline diagnosed and used the drug, no adverse reactions," - confirm again "the medication user has visited and used the drug offline, no adverse reactions," text message prompts "the doctor is inquiring about the condition" - issue an electronic prescription, provide medication guidance, prompt medication safety risks - pay the order - express delivery.

3.4 Differences in the Sales of Banned Drugs on Four Platforms

Regarding the results of the chi square test (Table 3), considering that the number of valid cases is 172 (meeting the condition of sample size ≥ 40), and the expected counts of all cells are ≥ 5 (minimum expected count is 21.25), which meets the applicable conditions of the Pearson's chi-square test, the Pearson's chi-square result is the main basis for judgment. The test showed a Pearson's chi-square value of 0.814, degrees of freedom of 3, and asymptotic significance (two-sided) of 0.846, indicating that the differences between the relevant variables did not reach a statistically significant level.

Table 3 chi square test

	Value	df	Asymptotic Significance(Two- sided)
Pearson chi square	0.814 ^a	3	0.846
Likelihood Ratio	0.815	3	0.846
Linear Association	0.042	1	0.838
Valid N	172		

a.The expected count of 0 cells (0.0%) is less than 5.The minimum expected count is 21.25.

4. Discussion

This study conducts empirical research on the sales status of banned drugs on Chinese e-commerce platforms. The study selected e-commerce platforms such as Taobao, JD.com, Meituan, and Ele.me as research scenarios, and used 43 drugs in the fourth category of the "*Banned List of Drugs for Online Sales (First Edition)*" as research objects. The results show that 58.1% of banned drugs can be purchased on the above-mentioned platforms, and some drugs have violations in their sales processes. Statistical analysis shows that there is no significant difference in the degree of violation of banned drug sales among the four platforms. Overall, the degree of violations in the sale of banned drugs on Chinese online platforms is relatively serious.

Among the four mainstream e-commerce platforms monitored this time, Ele.me ranked first with 23 banned drugs on sale, followed closely by JD.com with 22 banned drugs on sale, while Taobao and Meituan had 21 and 19 banned drugs respectively. This data intuitively reflects that although there are slight differences in the number of illegal and banned drugs sold on different platforms, the

overall phenomenon is that banned drugs circulate through online channels, and the scale of violations on each platform is at a similar level. It is worth noting that the circulation of banned drugs on the Chinese internet presents significant differences from the challenges faced by online drug regulation in the United States. Research on non-medical use of prescription drugs in the United States shows that the range of drugs available through online procurement for non-medical purposes (NUPM) channels is almost unlimited, covering a number of therapeutic drug categories with inadequate regulatory measures, including weight loss drugs, drugs for the treatment of attention deficit and hyperactivity disorder (ADHD), steroids, inhalants, contraceptives and related devices, opioids[22], various anesthetics, and drugs in serious shortage that have been illegally promoted on Internet platforms such as social media[23,24]. Compared to others, the core issue in China is that drugs that have been explicitly listed on the banned list still have illegal circulation.

Among the 43 banned drugs, antiepileptic drugs, antithrombotic drugs, and antifungal drugs are all on sale, 80% of antibiotics are on sale, and half of cardiovascular system drugs are on sale. Although the risk of abuse of antiepileptic drugs is high, there are still illegal individuals who exploit the inappropriate demand of certain groups to sell them illegally[25]. Improper use of antithrombotic drugs can cause severe bleeding, and antifungal drugs need to be strictly matched with indications. The standardized use of these drugs relies on professional guidance. However, some businesses and consumers lack awareness of their risks, leading to illegal sales and purchases. The illegal sales of antibiotics are clearly related to the current situation of antibiotic abuse in China. On the one hand, some consumers blindly rely on antibiotics and actively seek to purchase them[26]; On the other hand, some merchants ignore prescription requirements for sales, exacerbating the phenomenon of illegal sales, which also confirms the previous research's conclusion that there is a correlation between antibiotic abuse and non-standard sales[27]. The same problem exists with over-the-counter sales of antibiotics in the UK[28]. Cardiovascular system drugs, as commonly used drugs for chronic diseases, have formed a stable and strong market demand due to the large patient population. Some businesses, driven by profit, ignore sales standards and take risks[29,30]. The widespread illegal sales of various banned drugs mentioned above fully demonstrate the serious situation of online sales of banned drugs in China.

We observed that during the actual search process, no relevant banned drugs were found when searching with the keyword "generic name of the drug"; When searching with the keywords "generic name of drug+dosage form", sales information of related drugs can be obtained. Taking digoxin as an example, when the keyword "digoxin" is entered, the search results page shows no matching content; When entering the keyword 'digoxin tablets', the on sale information of the drug will be displayed. This phenomenon indicates that there are loopholes in the keyword filtering mechanism of e-commerce platforms, which have failed to effectively intercept the combination keywords of "generic name+dosage form". The potential risk is that it may increase the probability of patients and consumers obtaining banned drugs through the internet, and be easily exploited by illegal merchants, further exacerbating the compliance chaos of online drug sales.

We have observed that in the actual purchasing process, some e-commerce platforms have lowered their review standards and allowed gray operations such as "prescription filling" or "AI automatic prescription". Most existing studies indicate that most online pharmacies abroad do not require patients and consumers to hold valid prescriptions[31], nor do they require any medical related information[32]. In the UK, for example, consumers can easily purchase diazepam, fluoxetine and simvastatin from online pharmacies even without a prescription, and such purchase channels can be directly obtained through mainstream Internet search engines[33,34]. The strong demand of consumers for "quick drug purchase" has prompted the platform to continuously simplify the drug purchase process[35]; Some users also tend to directly obtain prescription drugs to avoid the cumbersome procedures of traditional medical systems. Driven by commercial interests, some third-party merchants and small platforms have further lowered the review threshold for drug sales in order to expand market share. Such self medication without professional supervision may expose

consumers to the risk of harmful adverse reactions and lead to an increase in incidence rate and mortality[36].

This study analyzed the sales of banned drugs on four major platforms through chi square test. The results showed that, under the conditions of sample size and theoretical frequency, the Pearson chi square value was 0.814 (degree of freedom=3, $p=0.846>0.05$), indicating that the differences in banned drug sales behavior among the four platforms did not reach a statistically significant level. This result does not indicate that the compliance of various platforms is good, but rather reveals a more alarming phenomenon: the illegal sale of banned drugs is not an isolated problem on a certain platform, but presents a universal feature across different platforms - regardless of the platform type, there are similar risks of illegal sales, and the degree is not significantly differentiated. This 'no significant difference' statistical result precisely confirms the severity of the current situation of online drug sales bans.

Currently, there is a widespread violation of online sales of banned drugs in China. Therefore, it is urgent to design and implement online drug sales supervision plans and intervention measures aimed at eliminating the circulation of banned drugs. Our research findings indicate that the lack or inadequate implementation of platform review mechanisms on e-commerce platforms has led to the illegal sale of banned drugs on the internet. From this, it can be seen that improving the standardization of platform audit processes, the professionalism of audit tools, and the accuracy of audit results can help restrict the improper circulation of banned drugs from the source. Our research results indicate that relying solely on a single platform for self audit and management is difficult to completely solve the problem of banned drug circulation. A long-term, national, government led, cross departmental collaborative network banned drug audit and supervision plan is needed - through the drug regulatory department to develop unified platform audit standards and technical specifications, promote cross platform audit data exchange and sharing; Establish a "blacklist for reviewing violations" in collaboration with market supervision, public security and other departments, and impose joint penalties on platforms and merchants who have repeatedly been banned from selling drugs due to review omissions; Incorporate the platform's audit capability into the qualification evaluation indicators for online drug sales, guide the platform to continuously optimize the audit system, ultimately promote the standardization and normalization of the audit standards for online drug sales platforms, and improve the regulatory consistency and public drug safety of China's online drug sales market.

Two limitations of this study should be noted. Firstly, our study investigated the sales of banned drugs on the four major e-commerce platforms, which only represents a portion of the platforms and may lead to an underestimation of the severity of actual violations. Therefore, future research needs to further expand the sample size to evaluate the illegal situation of online sales of banned drugs in China. Secondly, our sample for this study is only 43 banned drugs from the "*Banned List of Drugs for Online Sales (First Edition)*". The limitations of this sample selection may result in incomplete characterization of the overall scale and structural characteristics of illegal sales of banned drugs on the internet, making it difficult to fully reflect the circulation patterns of banned drugs of different categories and risk levels in online channels.

5. Conclusion

This study analyzes the current situation of illegal sales of banned drugs on the internet in China, revealing an urgent issue that needs to be addressed. Although the "*Banned List of Drugs for Online Sales (First Edition)*" has explicitly prohibited the online sales of some prescription drugs, providing institutional basis for regulating online drug transactions, there are still significant deficiencies in the compliance implementation of the list by e-commerce platforms in the actual implementation process. Various illegal sales behaviors continue to occur, and their potential risks and regulatory loopholes cannot be ignored. Faced with the severe situation of illegal sales of banned drugs on the

internet, China's regulatory authorities urgently need to take more effective measures to further strengthen the supervision of e-commerce platforms and merchants. This not only requires increasing the punishment for violations in accordance with the law to form an effective deterrent, but also requires the introduction of more advanced regulatory technology to achieve dynamic and accurate monitoring of the entire chain of drug online sales, thereby eliminating violations from the source and effectively ensuring the safety of public medication.



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