Journal of Clinical and Nursing Research, 2026, Volume 10, Issue 4
http://ojs.bbwpublisher.com/index.php/JCNR
Online ISSN: 2208-3693
Print ISSN: 2208-3685

An Empirical Study on the Quality Assessment and Improvement of Outpatient Prescriptions in Tertiary-Grade Class-A Hospitals under Multi-Policy Coordination

Bin Liu, Meiling Shao, Jun Liang, Fang Ye, Li Chen*

Pharmacy Department, TaiHe Hospital, Hubei University of Medicine, Shiyan 442000, Hubei, China

***Corresponding author:** Li Chen, 599100904 @qq.com

Abstract: *Objective*: To evaluate the quality of outpatient prescriptions for Western and proprietary Chinese medicines in a tertiary hospital under the coordinated implementation of DRG/DIP payment reform, the Tertiary Hospital Evaluation Standards (2025 Edition), and the National Performance Assessment of Tertiary Public Hospitals, and to examine the effectiveness of a policy-embedded management model. *Methods*: A triple stratified random sampling approach (disease category–department–month) was used to collect 4,996 outpatient prescriptions from January 2024 to September 2025. A four-dimensional framework (compliance, economy, efficacy, and risk) was established. Prescription quality was assessed using a risk-scoring model and Apriori association rule analysis. *Results*: The overall qualification rate was 96.2% (4,807/4,996). The mean number of drugs per prescription was 2.6 ± 0.8; antimicrobial use rate was 16.8%; essential medicines accounted for 62.5%; and drug cost proportion for key DRG/DIP disease groups was 28.3%, all meeting policy targets. Among 189 unqualified prescriptions, inappropriate medication use (38.5%) and minor omissions (48.7%) were the main issues. Association rules identified junior physicians in chronic disease management as a key risk factor (confidence > 40%). *Conclusion*: The policy-embedded model effectively improved core prescription quality indicators to required standards. Further optimization is needed for special populations, junior physician prescribing, and intelligent system support. The proposed Assessment–Insight–Intervention closed-loop model provides a practical framework for advancing refined prescription management.

Keywords: Outpatient prescription quality; DRG/DIP payment reform; National Performance Assessment; Antimicrobial stewardship; Association rule analysis

Online publication: Apr 30, 2026

1. Background

Outpatient prescriptions represent both the culmination of clinical decision-making and the starting point of

drug utilization, and are widely recognized as a core indicator of healthcare quality and hospital management performance [1]. Their quality is directly associated with patient safety, rational drug use, and efficient allocation of medical resources [2].

In recent years, China's healthcare system has undergone a transition toward coordinated policy governance. The implementation of DRG/DIP-based payment reform, the Tertiary Hospital Evaluation Standards (2025 Edition), and the National Performance Assessment of Tertiary Public Hospitals has established an integrated regulatory framework emphasizing quality, efficiency, and cost control [3–5]. Within this framework, key indicators, including prescription qualification rate (≥ 95%), proportion of essential medicines (≥ 60%), antimicrobial use rate (≤ 20%), and disease-specific drug expenditure, have become critical benchmarks for hospital evaluation and continuous quality improvement [6].

Tertiary hospitals, particularly large regional medical centers, manage a high volume of patients with complex and chronic conditions, where polypharmacy is prevalent and prescription appropriateness is more difficult to ensure [7]. Although previous studies have reported improvements in prescription qualification rates through routine prescription review and administrative interventions, most remain limited to descriptive analyses and lack systematic evaluation under multi-policy coordination [8,9]. As policy requirements evolve, merely achieving compliance is no longer sufficient; there is an increasing need to advance toward refined (lean) prescription management.

Therefore, this study, based on real-world data from a tertiary hospital that has already met core policy indicators, aims to evaluate prescription quality under coordinated policy constraints, identify potential risk patterns using data-driven methods, and develop a policy-embedded continuous improvement model for outpatient prescription management.

2. Methods

2.1. Study design and data source

This was a cross-sectional study. Data were extracted from the Hospital Information System (HIS) from January 1, 2024 to September 30, 2025.

2.1.1. Inclusion criteria

(1) Complete prescription information;

(2) Diagnoses corresponding to high-weight disease categories in the local DRG/DIP database (e.g., hypertension, diabetes).

2.1.2. Exclusion criteria

(1) Emergency prescriptions, inpatient medical orders, and prescriptions for anesthetic or Category I psychotropic drugs.

2.2. Sampling method

A triple stratified random sampling strategy (disease category–department–month) was applied to enhance representativeness. First, ten core disease categories were identified. Second, prescriptions were stratified across eight major outpatient departments. Third, monthly stratification (21 months) was performed, followed by random sampling within each stratum. A total of 4,996 prescriptions were included. The Kolmogorov–

Smirnov test indicated no significant difference between the sample and the overall population structure ($p > 0.05$).

2.3. Evaluation framework

A four-dimensional evaluation system was developed based on policy requirements and clinical guidelines.

(1) Compliance

Prescription qualification rate, antimicrobial use rate, and proportion of essential medicines.

(2) Economy

Proportion of drug costs for DRG/DIP disease groups and average drug cost per visit.

(3) Efficacy

Appropriateness rate of prescriptions, adjustment rate for special populations, and compliance rate of long-term prescriptions for chronic diseases.

(4) Risk

Prescriptions were classified into low-, medium-, and high-risk categories according to a pre-defined risk-scoring model based on error type, clinical impact, and regulatory sensitivity.

2.4. Statistical analysis

Descriptive statistics were conducted using SPSS 26.0. Categorical variables were expressed as frequency (percentage), and continuous variables as mean ± standard deviation. Apriori association rule analysis was applied to identify patterns among department, physician seniority, disease diagnosis, and types of inappropriate prescriptions (minimum support: 5%; minimum confidence: 30%). A two-sided $p < 0.05$ was considered statistically significant.

3. Results

3.1. Basic prescription characteristics and multi-policy conformity

Analysis of 4,996 outpatient prescriptions revealed that all core indicators met or exceeded national policy benchmarks (**Table 1**). The prescription qualification rate was 96.2%, the average number of drugs per prescription was 2.6 ± 0.8, the antimicrobial use rate was 16.8%, the proportion of essential medicines was 62.5%, the chronic disease long-term prescription compliance rate was 92.7%, and the drug cost proportion for key DRG/DIP disease groups was 28.3%. These results demonstrate substantial effectiveness in the coordinated multi-policy pharmaceutical governance of this institution.

Table 1. Conformity analysis of core prescription metrics with national policy benchmarks

Evaluation indicator	Study result	National policy / Industry standard	Conformity
Prescription qualification rate (%)	96.2	≥ 95 (2025 Tertiary Hospital Reaccreditation)	Yes
Number of drugs per prescription	2.6 ± 0.8	1.6–2.8 (WHO Recommendation)	Yes
Antimicrobial use rate (%)	16.8	≤ 20 (Antimicrobial Stewardship Guidelines)	Yes
Proportion of essential medicines (%)	62.5	≥ 60 (National Performance Assessment of Tertiary Public Hospitals)	Yes
Proportion of drug costs for DRG/DIP key diseases (%)	28.3	≤ 30 (DIP Payment Rules)	Yes

3.1.1. Patient demographics and disease spectrum

Patients aged 45–59 years constituted the largest age group (47.9%, 2392/4996). The predominant disease categories were cardiovascular and cerebrovascular diseases (23.4%), respiratory diseases (18.8%), and digestive diseases (15.2%), consistent with the institution's role as a regional medical center.

3.2. In-depth analysis and risk stratification of non-conforming prescriptions

Among the 189 non-conforming prescriptions (3.8%), minor omissions (e.g., missing contact information) were most common (48.7%, 92/189), followed by inappropriate medication prescriptions (38.5%, 73/189). Risk stratification using the prescription risk scoring model revealed no high-risk prescriptions; medium-risk prescriptions were entirely concentrated in the inappropriate medication category, while low-risk prescriptions consisted primarily of minor omissions and non-standardized prescriptions (**Table 2**). These findings indicate that managerial focus has shifted from intercepting critical errors toward optimizing clinical decision-making and refining prescribing details.

Table 2. Types and risk grading statistics of non-conforming prescriptions (n = 189)

Type of non-conformity	Number of prescriptions (n)	Proportion (%)	Risk level	Typical case
Non-standardized prescriptions	24	12.8	Low risk	
Exceeding 7-day supply without annotation	15	7.9	Low risk	Antihypertensive medication prescribed for 30 days without selecting "chronic disease"
Incomplete diagnosis information	9	4.9	Low risk	Diagnosis recorded only as "dizziness" without confirming etiology
Inappropriate medication prescriptions	73	38.5	Medium risk	
Inappropriate indications	28	14.8	Medium risk	Rosuvastatin prescribed to a hypertensive patient without indications for hyperlipidemia
Inappropriate dosage and administration	25	13.2	Medium risk	Caltrate D prescribed as "twice daily" instead of the recommended once at bedtime
Inappropriate drug selection	12	6.3	Medium risk	Ibuprofen, which may elevate blood pressure, prescribed to a hypertensive patient
Inappropriate dosage form or route	8	4.2	Medium risk	Nasal spray mistakenly prescribed for oral administration
Prescriptions with minor omissions	92	48.7	Low risk	Missing non-critical information such as patient occupation and contact number
Total	189	100.0		

3.3. Association rule mining and risk prediction of irrational prescriptions

Association rule analysis (Apriori algorithm; minimum support 5%, minimum confidence 30%) identified three high-confidence rules that precisely delineated the structural weak points in prescribing quality:

(1) Rule 1

Prescriptions issued for hypertension by physicians with less than five years of practice in the Cardiovascular Department are highly associated with the error of exceeding a 7-day medication supply

without proper annotation (support 6.8%, confidence 42.3%).

(2) Rule 2

Prescriptions issued by attending physicians in the Endocrinology Department for type 2 diabetes mellitus are significantly associated with errors in dosing regimens (support 5.5%, confidence 40.1%).

(3) Rule 3

Prescriptions issued by resident physicians in the Respiratory Medicine Department for acute bronchitis are closely linked to inappropriate antibiotic selection (support 5.1%, confidence 38.7%).

4. Discussion

4.1. Synergistic effects and value of the policy-embedded management model

The findings of this study indicate that by systematically embedding the requirements of tertiary hospital re-accreditation, DRG/DIP payment reform, and the National Performance Assessment (National Performance Assessment) into the pharmacy management workflow, hospitals can achieve coordinated goals across prescription quality, operational efficiency, and cost containment. A prescription qualification rate of 96.2% and a compliance rate of 92.7% for chronic disease long-term prescriptions reflect steady improvement in healthcare quality [9]. Meanwhile, maintaining the drug cost proportion for key DRG/DIP diseases at 28.3% demonstrates refined management capability under prospective payment reform, providing assurance for the safe and efficient use of medical insurance funds [10]. An essential medicines proportion of 62.5% and an antimicrobial use rate of 16.8% not only meet the National Performance Assessment benchmarks, but also promote a profound shift in clinical medication philosophy toward value-based healthcare [11].

4.2. Lean risk insight and early warning under a standards-met context

On the basis of overall compliance, this study integrated a risk scoring approach with association rule mining, enabling management to move from macro-level qualification rates to micro-level risk points. The results show that unqualified prescriptions exhibited a clear structural pattern, with inappropriate medication (38.5%) and minor omissions (48.7%) as the dominant issues. Although such problems may not markedly reduce the overall qualification rate, they represent persistent and potentially amplified risk sources under increasingly stringent policy and quality governance requirements.

Notably, the association rule analysis further identified that prescribing by junior physicians in chronic disease management constituted a key risk node for irrational prescriptions (confidence > 40%). This suggests that, in tertiary hospitals with a heavy chronic disease burden, prescribing risk is not merely driven by isolated errors, but is closely related to clinician experience, disease characteristics, and specific outpatient service scenarios. Therefore, establishing an early warning mechanism targeting key populations, key departments, and key prescriber groups is essential to achieve the transition from compliance-oriented management to lean, risk-preventive management [12].

4.3. Continuous optimization pathways: From compliance to excellence

(1) System empowerment upgrade

Strengthening Intelligent Review and Human–Machine Collaborative Governance. With the progressive application of intelligent systems in prescription review, it is recommended to further optimize clinical decision support rules, enhance the accuracy of automatic alerts, and reduce alert fatigue, thereby

improving the real-world effectiveness of intelligent review + pharmacist intervention. In addition, the review system should be more deeply integrated with DRG/DIP payment rules and the National Performance Assessment indicator system to support refined, scenario-based management, achieving a leap from post-prescription correction to pre-prescription prevention [13].

(2) Management mechanism restructuring

Establishing Data-Driven Precision Performance Management. Based on the association rule findings, a targeted empowerment program on standardized long-term prescriptions for chronic diseases and DRG/DIP policies should be implemented for junior physicians. Advanced indicators such as prescription risk grading and essential medicines utilization effectiveness should be incorporated into the performance appraisal system, guiding clinical behaviors toward higher quality and higher value.

(3) Deepening clinical services

Expanding the Scope and Depth of Pharmacy Services. A patient-centered deprescribing strategy should be promoted, particularly for older adults with polypharmacy [14,15]. Meanwhile, drug therapy pathways (Clinical Pathway) for DRG/DIP disease categories should be optimized, and patient education on medication adherence and policy communication should be strengthened to build a collaborative medication safety ecosystem.

5. Conclusion

This study shows that the systematic implementation of a "policy-embedded" management model enables tertiary hospitals to achieve strong alignment between outpatient prescription quality and national policy requirements. However, compliance is not the endpoint but the starting point for lean management. This study establishes a closed-loop model of "evaluation–insight–intervention" and applies data mining to accurately identify and predict potential risks. The proposed lean management pathways provide both a theoretical framework and practical guidance for improving pharmaceutical management efficiency and advancing high-quality development. Future research should focus on long-term evaluation of intervention effects and the feasibility of scaling this model to hospital-wide quality management systems.

Disclosure statement

The authors declare no conflict of interest.

References

[1] National Health Commission, 2018, Prescription Review Standards for Medical Institutions. Guo Wei Ban Yi Fa [2018] No.14.

[2] National Health Commission, 2024, Standards for the Evaluation of Tertiary Hospitals (2025 Edition, Draft for Comments).

[3] National Healthcare Security Administration, 2021, Notice on Issuing the Three-Year Action Plan for DRG/DIP Payment Reform. Yi Bao Fa [2021] No.48.

[4] General Office of the State Council, 2019, Opinions on Strengthening Performance Assessment of Tertiary Public Hospitals. Guo Ban Fa [2019] No.4.

[5] National Health Commission, 2021, Notice on Issuing the Management Standards for Long-Term Prescriptions (Trial). Guo Wei Ban Yi Fa [2021] No.17.

[6] Revision Working Group of Antimicrobial Stewardship Guidelines, 2015, Antimicrobial Stewardship Guidelines: 2015 Edition [M]. Beijing: People's Medical Publishing House.

[7] Deng H, Wang F, Zhang C, et al., 2025, Evaluation of the Construction and Effectiveness of an Outpatient Smart Pharmacy Based on the PDCA Cycle. China Modern Medicine, 32(08): 140–143.

[8] Wu Y, Chen S, Xian Q, et al., 2022, Practice of Refined Pharmaceutical Management with Clinical Pharmacist Participation in Gastroenterology under the DRG Background. China Pharmacy, 33(17): 2157–2161.

[9] Chinese Society of Cardiology, 2023, Chinese Guidelines for the Prevention and Treatment of Hypertension (2023 Revision). Chinese Journal of Cardiology, 51(3): 209–269.

[10] Ni Y, Liao J, Xiao Q, et al., 2023, Application of Parameter Allocation-Based DIP Cost Accounting in Lean Operation Management of Public Hospitals. Chinese Health Economics, 42(10): 60–64 + 70.

[11] National Health Commission, 2024, National Essential Medicines List (2024 Edition).

[12] Gong J, Wu J, 2021, Analysis of Causes and Influencing Factors of Irrational Drug Use in Outpatient Prescriptions and Countermeasures. China Modern Medicine, 28(05): 211–214.

[13] Gu J, Ding L, Ma Z, et al., 2025, Construction and Application Effect of a Prescription Review System. Chinese Journal of Drugs and Clinical Practice, 25(15): 954–959 + 953.

[14] Branch of Geriatric Health Service and Standardization, China Association of Gerontology and Geriatrics, 2023, Criteria for Potentially Inappropriate Medication Use in Older Adults in China (2023 Edition). Chinese General Practice, 26(34): 4237–4247.

[15] Lin Z, Wang L, Liu G, et al., 2025, Challenges in Medication Management for Older Adults with Multimorbidity and Multidisciplinary Integrated Solutions. China Medical Herald, 22(17): 74–79.