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Construction of Management Index System for Rational Drug Use of Key Monitoring Drugs

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Abstract: The purpose of this study is to build a scientific, systematic and operable management index system for rational drug use of key monitoring drugs, so as to standardize clinical drug use behavior, improve medical quality and reduce medical costs. The research adopts a three-stage path of theoretical construction-empirical verification-dynamic optimization. Through literature research, policy analysis, hospital practice investigation, Delphi method and analytic hierarchy process (AHP), a three-stage index system covering drug procurement, prescription review, clinical use and adverse reaction monitoring is constructed. The system includes 4 first-level indicators, 8 second-level indicators and 17 third-level indicators. The weight distribution is scientific and reasonable, and 82% of them are quantitative indicators that can be measured by data. In the empirical verification stage, six different levels of medical institutions were selected for pilot operation. The results of double difference analysis showed that the experimental group was significantly better than the control group in the core evaluation indicators such as average prescription amount, antibacterial drug utilization rate and prescription intervention response time. In addition, the study also established a dynamic optimization mechanism based on PDCA cycle and a "four-in-one" information platform to ensure the continuous adaptability and scientificity of the index system. The index system constructed in this study has the characteristics of policy compliance, clinical practicability, dynamic adaptability and data integration, which fully meets the requirements of DRG payment reform, provides a scientific tool for rational drug use management in medical institutions, and also provides a reference for relevant policy formulation.

1. Introduction

Rational drug use is an important link to ensure patient safety, improve medical quality and control medical expenses. In recent years, with the rapid development of China's medical and health undertakings, there are more and more kinds of clinical drugs, and irrational drug use also occurs from time to time, which has brought negative effects on patients' health and social economy [1]. In order to strengthen the management of drug use and standardize the clinical drug use behavior, the National Health and Wellness Committee and other departments have successively issued a series of policy documents, explicitly requiring medical institutions to establish and improve the management system of key monitored drugs.

The key monitoring drugs usually refer to those drugs that have large clinical use, high cost, and

may have abuse risks or potential safety hazards. The rational use of these drugs is not only related to the therapeutic effect of patients, but also directly affects the rational distribution of medical resources and the safe operation of medical insurance funds [2]. Therefore, it is particularly important to construct a scientific, systematic and operable management index system for rational drug use of key monitoring drugs. The index system aims to help medical institutions find and correct irrational drug use behaviors in time through quantitative evaluation, promote clinical rational drug use, and finally achieve the goal of improving medical quality and reducing medical costs [3].

Based on the relevant research results at home and abroad and the actual situation in China, this study constructs a set of index system suitable for rational drug use management of key monitoring drugs. The system will cover drug procurement, prescription review, clinical use, adverse reaction monitoring and other links, and fully consider the characteristics and needs of different medical institutions. The feasibility and effectiveness of the index system are verified through empirical research, which provides scientific management tools for medical institutions and provides reference for relevant government departments to formulate relevant policies. The development of this study will help to promote the management level of rational drug use in China, promote the optimal allocation of medical resources, and ultimately benefit the majority of patients.

2. System construction method of indicators

2.1. Research framework design

This study adopts a three-stage research path of theoretical construction-empirical verification-dynamic optimization. Firstly, the theoretical model is built through literature research and policy analysis, then the index system is improved by Delphi method and Analytic hierarchy process (AHP), and finally it is verified by medical institutions and dynamically adjusted [4-5].

2.2. Specific implementation method

2.2.1. Index system construction

The primary selection index pool was established through mixed research methods, including literature analysis to screen 32 high-quality documents from 2018 to 2023 to extract common indicators, policy text analysis to collate 18 documents issued by National Health Commission to obtain mandatory indicators, and combined with field research and drug use data mining in three 3A hospitals, a preliminary index system was formed (Table 1).

Table 1 Source analysis of primary selection indicators

Source type	Quantity	Proportion	Examples of typical indicators
Literature research	46	52%	Prescription qualification rate, DDDs
Policy requirements	28	32%	Antibacterial drug use intensity
Hospital practice	14	16%	Proportion of key drug expenses

Table 2 Composition of expert group

Category	Number of people	Proportion
Clinical pharmacy	5	33%
Clinical Medicine	4	27%
Hospital management	3	20%
Health policy	3	20%

A 15-member expert group was formed by Delphi method (see Table 2 for the structure), and

two rounds of consultation were conducted. The final expert authority coefficient Cr was 0.87 (up to standard) and the coordination coefficient W was 0.42 (χ^2= 136.5, P<0.01), which ensured the scientificity and consistency of the index system construction.

2.2.2. Optimization of index system

In the optimization stage of the index system, the weight [6-7] is calculated by using the AHP, and a three-level index system (Table 3) is constructed. The system includes 4 first-level indicators, 8 second-level indicators and 17 third-level indicators, and the weight distribution is scientific and reasonable. Among them, the consistency ratio CR of the criterion layer is 0.032 (passing the criterion < 0.1), and all the indexes CR of the scheme layer are less than 0.1, which ensures the scientificity and rationality of the weight distribution.

Table 3 Three-level index system for rational drug use management of key monitoring drugs

First-class indicators and weights	Secondary indicators and weights	Three-level indicators and weights	Combination weight calculation	Combined weight result
A1. Drug selection management (0.25)	B1. Directory management (0.40)	C1. Timeliness of catalogue update (0.30)	0.25 * 0.40 * 0.30	0.030
		C2. Integrity of expert argumentation (0.70)	0.25 * 0.40 * 0.70	0.070
	B2. Procurement control (0.60)	C3. Implementation rate of centralized procurement (0.55)	0.25 * 0.60 * 0.55	0.0825
		C4. Approval rate of filing procurement (0.45)	0.25 * 0.60 * 0.45	0.0675
A2. Prescription audit management (0.20)	B3. Prescription pre-audit (0.60)	C5. Audit system coverage (0.40)	0.20 * 0.60 * 0.40	0.048
		C6. Interception rate of high-risk prescriptions (0.60)	0.20 * 0.60 * 0.60	0.072
	B4. Prescription comments (0.40)	C7. Review prescription coverage (0.50)	0.20 * 0.40 * 0.50	0.040
		C8. Rectification rate of problem prescription (0.50)	0.20 * 0.40 * 0.50	0.040
A3. Clinical use management (0.35)	B5. Drug specification (0.50)	C9. The coincidence rate of indications (0.35)	0.35 * 0.50 * 0.35	0.06125
		C10. Rational dosage rate (0.35)	0.35 * 0.50 * 0.35	0.06125
		C11. Reasonable rate of treatment (0.30)	0.35 * 0.50 * 0.30	0.0525
	B6. Usage monitoring (0.50)	C12. DDDs fluctuation anomaly rate (reverse indicator) (0.60)	0.35 * 0.50 * 0.60	0.105
		C13. Cost proportion of key drugs (reverse indicator) (0.40)	0.35 * 0.50 * 0.40	0.070
A4. Quality Monitoring Management (0.20)	B7. Adverse reaction monitoring (0.55)	C14. Timely rate of ADR report (0.50)	0.20 * 0.55 * 0.50	0.055
		C15. Disposal rate of severe ADR (0.50)	0.20 * 0.55 * 0.50	0.055
	B8. Effect evaluation (0.45)	C16. The effective rate of treatment (0.60)	0.20 * 0.45 * 0.60	0.054
		C17. Patient satisfaction (0.40)	0.20 * 0.45 * 0.40	0.036

Its practicability and operability are ensured through the verification of SMART principle, 82% of which are quantitative indicators that can be measured by specific data, and the remaining qualitative indicators are also designed with operable scoring standards.

2.2.3. Empirical verification

In the empirical verification stage, six different levels of medical institutions (including two 3A hospitals, two 2B hospitals and two community hospitals) were selected for a three-month pilot operation, and the drug use data, prescription review records, adverse reaction reports and medical insurance cost data of HIS system were collected to test the actual application effect of the index system.

In order to scientifically evaluate the implementation effect, the double difference method was used to analyze, and the hospitals that implemented the index system were set as the experimental group, while the similar hospitals that did not implement the index system were set as the control group. The changes in the core evaluation indexes between the two groups were emphatically compared (see Table 4) to ensure the objectivity and reliability of the results.

Table 4 Comparison of key indicators before and after the pilot

Index	Experimental group change	Changes of control group
Average prescription amount	-18.7%	-2.3%
Utilization rate of antibacterial drugs	-29.4%	-5.1%
Prescription intervention response time	Shorten by 56%	No significant change

3. Dynamic optimization mechanism

Relevant government departments need to establish a dynamic optimization mechanism based on PDCA (Plan-Do-Check-Act) cycle, including continuous monitoring, feedback and adjustment. Define early warning thresholds for key indicators, for example, when the monthly DDD increases by more than 15%, an alarm will be triggered. The quarterly data analysis and reporting system is implemented, and the index weight coefficient is revised by entropy weight method every year to ensure the continuous adaptability and scientific rigor of the evaluation framework.

Relevant government departments need to develop an integrated "four-in-one" information platform, and integrate an intelligent prescription review system (with a knowledge base of more than 6,000 drug-related rules), a real-time monitoring dashboard, a mobile drug use early warning application and a data analysis module. Using machine learning algorithm to predict the trend of drug use, and comprehensively and intelligently manage rational drug use in the whole nursing process. In order to ensure the effective implementation of the system, supporting the implementation of organizational and institutional support, a special working group of the Hospital Pharmaceutical Affairs Management Committee was established, a three-level ladder training system (basic-professional-management) was established, relevant indicators were included in the quality assessment of departments (accounting for ≥15%), and a special incentive fund for rational drug use was established to strengthen the incentive mechanism.

The index system constructed in this study has four characteristics: policy compliance, clinical practicability, dynamic adaptability and data integration. It fully meets the requirements of DRG payment reform, sets differentiated index thresholds to meet the needs of different medical institutions, establishes a quarterly adjustment mechanism, and realizes data interoperability with the medical insurance audit system to improve management efficiency and scientificity. In order to further improve the application of the system, it is suggested to further research and develop an intelligent monitoring toolkit, establish a regional drug quality evaluation benchmark value, explore

the prescription behavior portrait technology based on big data, and improve the comprehensive evaluation model of drug use benefit-risk, so as to promote the accurate and intelligent development of rational drug use management.

4. Conclusion

The index system of rational drug use of key monitoring drugs constructed in this study has four characteristics: policy compliance, clinical practicability, dynamic adaptability and data integration. It comprehensively meets the requirements of DRG payment reform, sets the threshold of differentiated indicators to meet the needs of different medical institutions, establishes a quarterly adjustment mechanism, and realizes data exchange with the medical insurance audit system to improve management efficiency and scientificity. Through empirical verification, the index system effectively reduces the average prescription amount and the utilization rate of antibacterial drugs in pilot medical institutions, and significantly shortens the response time of prescription intervention. In order to further improve the application of the system, it is suggested to further research and develop an intelligent monitoring toolkit, establish a regional drug quality evaluation benchmark value, explore the prescription behavior portrait technology based on big data, and improve the comprehensive evaluation model of drug use benefit-risk, so as to promote the accurate and intelligent development of rational drug use management.

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