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Optimization Strategies and Application of Information-assisted Decision-making System for Centralized Procurement of Drugs Under the Normalization of Collective Procurement Policy

Li Li, Guanxing Zheng, Jing Li, Han Gao*(Corresponding author), Peng Zhang

Pharmacy Department, Shaanxi Provincial People's Hospital, Xi'an, 710000, China

Abstract: **Objective:** Our hospital has developed a centralized procurement drug information-assisted decision-making system based on our actual operation mode and the current usage status of centrally procured drugs. We aimed to optimize and upgrade this system based on its original foundation. **Methods:** We addressed practical issues by adding corresponding modules, such as a demand forecasting module, a clinical task allocation informationized module, and a real-time monitoring and calculation module for surplus fund retention amounts. **Results:** The optimized system can reduce subjective errors in our hospital's reporting, intelligently allocate clinical department tasks, and provide real-time monitoring of abnormal indicators and surplus fund retention amounts. **Conclusion:** The optimization of the centralized procurement drug information-assisted decision-making system effectively addresses the urgent needs of our hospital's current drug procurement implementation, enabling the sustainable implementation of our hospital's procurement work.

Keywords: Centralized procurement of drugs; Information-assisted decision-making system; Improvement and optimization

1. Introduction

The collective procurement policy is a crucial measure in deepening the reform of the medical system and transitioning the function of medical insurance funds from passive payment to strategic purchasing[1]. It is imperative for medical institutions to steadfastly implement this policy. In order to implement the national drug procurement policy, various medical institutions have actively explored drug procurement work schemes, including forming a multi-departmental collaborative management model, timely adjusting hospital drug lists, establishing supervision and assessment mechanisms for the use of selected drugs, and managing the use of non-selected drugs and similar drugs not procured through collective procurement[2-4]. At every stage of drug procurement implementation, whether it is the initial demand forecasting or later usage monitoring, a large amount of data extraction and calculation are involved[5]. Therefore, the informatization of drug procurement work is undoubtedly the inevitable trend for its normalized development, providing strong support for the orderly progress and steady advancement of drug procurement work in hospitals. With the normalization of the national drug procurement work, the number of procurement items has increased sharply, and the renewal policies for different procurement batches are constantly being updated. Additionally, the implementation of surplus fund retention policies presents new challenges for hospital drug procurement work[6], requiring further upgrades and transformations of hospital information systems to achieve refined management of centrally procured drugs[7].

Our hospital has independently developed the Information-Assisted Decision-Making System for Centralized Procurement of Drugs[9], combining our hospital's actual operational mode and the current usage status of centrally procured drugs. Now, in response to the typical problems encountered in the normalization of the procurement policy, we have upgraded and optimized our independently developed system to address the particularly large workload of data calculation tasks.

2. Content

2.1 Establishment of the centralized procurement drug demand forecasting module

Utilizing the existing modules of the Information-Assisted Decision-Making System for Centralized Procurement of Drugs, we have compiled usage data of centrally procured drugs and established a monitoring indicator library based on relevant policies and actual needs. This library includes indicators such as the execution status of drug procurement processes, the usage of selected products, and the usage of alternative drugs. We employed machine learning models such as random forest and Lasso regression to establish the centralized procure-

ment drug demand forecasting module. Before the commencement of procurement, standardized data on the hospital's medication catalog were prepared, and various drug attributes were categorized. Based on this categorization, similar drugs were optimized for combination and consolidation, and procurement quantities were predicted for centrally procured drugs based on drug attribute variables. This process reduced subjective errors in demand forecasting and provided data references for rational demand reporting, especially during the renewal of multiple procurement contracts for the same drug category.

2.2 Establishment of the informationized module for clinical task assignment of centralized procurement drug quantities

Dynamic parameters were set in the Information-Assisted Decision-Making System for Centralized Procurement of Drugs to automatically extract historical data of various clinical departments over a selected period. The system recorded the relationship between selected drugs and non-selected drugs and automatically calculated the usage quantities of multiple drugs with the same name and specifications. It also automatically calculated the proportion of usage in clinical departments and sorted the data accordingly. The sorted data were compared with the agreed procurement quantities and adjusted according to the actual clinical usage, facilitating intelligent and scientific task assignment to clinical departments. Moreover, it controlled the usage range of alternative drugs.

2.3 Establishment of the real-time monitoring and calculation module for surplus fund retention of centralized procurement drugs

During the procurement process, a warning indicator library model was established based on relevant policies and regulatory requirements. By comparing actual execution data with warning indicators, the current execution data were extrapolated to the entire procurement cycle to calculate the surplus fund retention base amount. This enabled the system to provide early warnings for abnormal indicators and predict the surplus fund retention amount in real-time. Hospitals could timely adjust procurement behavior based on warning information and forecast results, maximizing the benefits of surplus fund retention. The surplus fund retention calculation module allowed for the flexible combination of key indicators and reference indicators for simulation calculation and real-time monitoring. After the procurement cycle ended, it facilitated assessment and rating, as well as one-click calculation of surplus fund retention amounts.

3. Results

The centralized procurement drug demand forecasting module reduced subjective errors in demand reporting and provided data references for rational demand reporting. The Informationized module for clinical task assignment of centrally procured drug quantities significantly reduced workload and increased work efficiency by three times. The real-time monitoring and calculation module for surplus fund retention simulated the calculation of the hospital's surplus fund retention base amount and enabled real-time monitoring of surplus fund retention amounts. As a result, the hospital's surplus fund retention increased by 23%.

4. Discussion

The optimization and upgrading of our hospital's centralized procurement drug information-assisted decision-making system address typical challenges encountered in the current normalization and implementation of centralized procurement policies. These challenges include the rapid increase in the number of drug varieties, continuous updates to policies for the renewal of different procurement batches, and the implementation of surplus utilization policies. By enhancing the existing system and focusing on developing information technology solutions to handle significant data calculation workloads, we added modules for drug procurement forecasting, clinical task allocation, and monitoring and calculation of surplus utilization amounts. Starting from the current status of centralized procurement and real-world problems, we proposed innovative problem-solving approaches and integrated digital thinking to align with our hospital's specific needs, effectively addressing urgent requirements in the implementation of centralized procurement drugs and ensuring the sustainability of our hospital's operations.

The optimization of the system significantly enhances the efficiency of drug procurement in our hospital. It enables scientifically reasonable forecasting of procurement quantities, particularly for predicting the increased usage of similar drugs in multiple procurement batch renewals, thereby reducing subjective reporting errors and assisting the hospital in smoothly meeting agreed-upon procurement targets. The system's intelligent allocation of clinical department tasks and calculation of the range of alternative drug usage scientifically manages data and effectively improves work efficiency. Through the comparison of actual execution with warning indicators, the system enables real-time monitoring of abnormal indicators and surplus utilization amounts. Hospital procurement behaviors can be promptly adjusted based on warning information and forecasted results to maximize surplus utilization funds.

5. Conclusion

This study addresses typical challenges encountered in the current implementation of centralized procurement policies by optimizing and upgrading our hospital's centralized procurement drug information-assisted decision-making system. By focusing on the specific needs of our

hospital and integrating digital solutions, we effectively resolve urgent requirements in centralized procurement drug implementation, ensuring the sustainability of our hospital's procurement operations.

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