

Innovation and Practice of the Whole-Process Fine Management of Low-Value Consumables in Public Hospitals

Xiaowang Pan, Yining Jiang*

The First Affiliated Hospital of Wenzhou Medical University, Wenzhou, China
Email: *guyangai@126.com

How to cite this paper: Pan, X.W. and Jiang, Y.N. (2025) Innovation and Practice of the Whole-Process Fine Management of Low-Value Consumables in Public Hospitals. *Open Journal of Applied Sciences*, 15, 809-818.

<https://doi.org/10.4236/ojapps.2025.154054>

Received: March 4, 2025

Accepted: March 25, 2025

Published: March 28, 2025

Copyright © 2025 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

With the promotion of high-quality development of public hospitals and DRG payment reform, medical cost control has become the key to hospital management [1]. This paper focuses on the management of low-value non-medical consumables (e.g., office supplies, cleaning consumables, general instruments, etc.) in public hospitals, and proposes a data-driven whole-process refined management model. By constructing a three-level classification and coding system, dynamic consumption quota standard and ABC classification method [2], combined with the application of intelligent support platform, the whole chain digital management from procurement, storage, use to write-off is realized. It has been proved that this model effectively improves the efficiency of hospital resource use, reduces the hidden waste of low-value consumables, optimizes procurement and inventory management, and provides a replicable paradigm for low-value consumable management in public hospitals. This study further validates the universality of fine management in medical resource optimization and provides empirical evidence for policy makers.

Keywords

Low Value Consumables, Refined Management, Data-Driven, Intelligent Management, Public Hospitals

1. Introduction

Low-value consumables (e.g. office consumables, cleaning supplies, general instruments, etc.) occupy an important position in the daily operation of public hospitals, yet their management is often in a sloppy state. According to the 2023 China Hospital Operation and Management Blue Book, the average annual ex-

penditure on low-value consumables in tertiary hospitals exceeds 50 million yuan, with a hidden waste rate of 18% - 25%. The management of these low-value consumables, despite their large number and variety, often fails to receive sufficient attention. Compared with high-value medical consumables, the management of low-value consumables is often neglected, leading to frequent wastage in hospitals in procurement, inventory and use, which in turn affects the overall operational efficiency of hospitals.

In order to cope with this problem, this paper proposes a data-driven whole-process refined management model [3], which aims to optimize the procurement, storage, use and recycling process of low-value consumables, improve the efficiency of resource use, and reduce the operating costs by constructing a scientific and standardized management system and an intelligent support platform [4]. Taking a tertiary hospital in Wenzhou as an example, the expenditure data of low-value consumables from 2019 to 2024 (2019: 12.54 million, 2020: 12.38 million, 2021: 17.42 million, 2022: 16.57 million, 2023: 12.3 million, 2024: 13.75 million) show that after the implementation of refined management, the expenditure has dropped significantly, especially in 2023 and 2024, a 21% reduction from the peaks in 2021 and 2022 (Figure 1).

Figure 1 shows that in 2021, after building a scientific standardized management system and an intelligent support platform, the consumption data of low-value consumables in a hospital has been reduced.

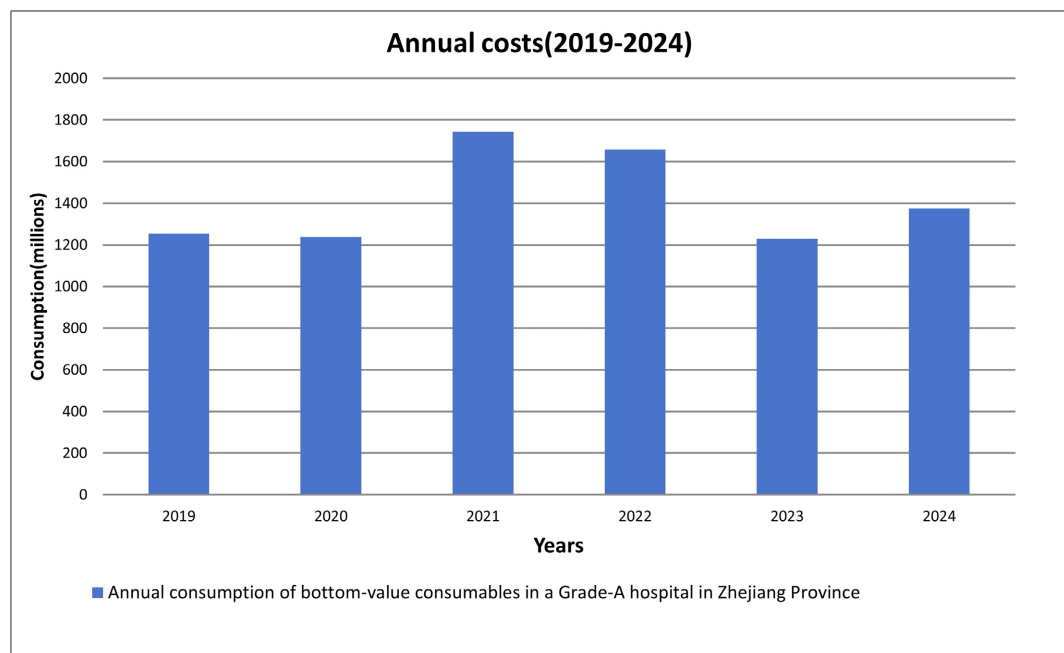


Figure 1. Annual consumption of bottom-value consumables in a Grade-A hospital in Zhejiang.

2. Analysis of the Current Situation and Problems

At present, the management of low-value non-medical consumables in public hospitals is still in the stage of rough management, mainly in the following aspects:

2.1. Lack of Standardized Management System

Currently, public hospitals generally lack a unified management standard and classification system for the management of low-value consumables. There is a wide variety of low-value consumables (such as office consumables, cleaning supplies, equipment accessories, etc.), but most hospitals have not established scientific classification and coding rules, which leads to frequent problems such as discrepancies between the physical and financial accounts, and duplicate purchases. For example, one department may label the same disinfectant as “B01-Disinfectant”, while another department uses the code “HQ-Cleaning Supplies”, resulting in information confusion during cross-departmental collaboration. In addition, hospitals often fail to keep timely accounts after purchasing due to management omissions, and financial departments only focus on quantity but neglect value accounting during inventory, leading to the phenomenon of substandard products and discrepancies between accounts and reality. The lack of standardized management is also reflected in the process of reporting losses, where some items that are still of value are incorrectly scrapped due to the lack of detailed categorization of the items reported as lost, exacerbating the waste of resources.

2.2. Failure of Process Supervision

There is a lack of standardized supervision of the procurement and use of low-value consumables. On the one hand, there is arbitrariness in the procurement process, and the department often bypasses the annual budget management and adopts the mode of “purchasing on demand”, and there is even the case that the supplier directly delivers the goods and then makes up the procedures for entering and leaving the warehouse, which is a serious violation of the principle of internal control. On the other hand, the financial and auditing departments failed to establish an effective binding mechanism, asset managers rarely check the use of consumables in the department on the spot, resulting in the widespread phenomenon of “consumption by receipt” (*i.e.*, the amount of receipt is much higher than the actual consumption). This lack of supervision makes it difficult for hospitals to track the real flow of low-value consumables, resulting in a hidden loss of assets.

2.3. Weak Technical Support

Most hospitals still rely on manual ledgers and paper records in the management of low-value consumables, and the application rate of technologies such as the Internet of Things and big data is insufficient. In addition, there is a serious phenomenon of data silos between internal hospital information systems (e.g., HIS, financial systems) [5], and the data on consumable use cannot be linked in real time with departmental costing, resulting in lagging management decisions.

The deep-seated reason for the above problems is the lack of knowledge of hospitals about low-value consumable management, according to the research of China Hospital Director 2023, only 35% of hospitals include low-value consumable management in their annual priorities. Hospitals tend to give priority atten-

tion to high-value medical consumables and ignore the fine management of low-value consumables. Therefore, comprehensive optimization is needed in terms of standardized management system, intelligent technical support and process reengineering in order to truly realize the refinement of low-value consumables management (Figure 2).

Figure 2 shows the components of the hospital's intelligent operation and maintenance system for low-value consumables.

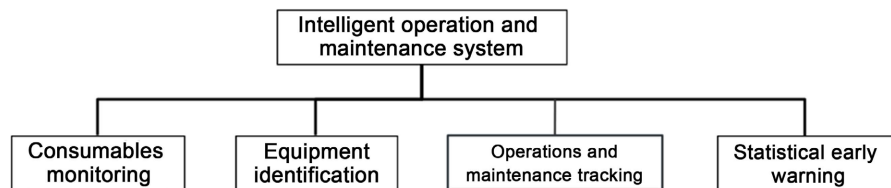


Figure 2. Intelligent operation and maintenance system functional modules.

3. Full Process Management Framework Design

Aiming at the main problems in the management of low-value consumables, this paper proposes a whole-process refined management framework (Figure 3) based on three-level classification code, consumption quota and ABC classification method, which is designed as follows:

3.1. Structured Design of the Three-Level Classification and Coding System

In order to solve the problem of complicated types and confusing management of low-value consumables, this paper builds a three-level classification and coding system of “major category - medium category - detailed category”:

Classification (first-level classification): Low-value consumables are divided into 8 basic categories according to functional attributes, such as office supplies (Class A), cleaning supplies (Class B), instrument supplies (Class C), etc., so as to clarify the management boundaries. The basis of classification refers to the National Standard for Material Classification in Medical Institutions (GB/T 14885-2020) to ensure compatibility with the existing management system.

Middle category refinement (secondary classification): further subdivision under the broad category, such as cleaning consumables can be subdivided into disinfection supplies, garbage disposal tools, etc.

Sub-category coding (third-level classification): Through the combination of “letter + number” coding, to ensure that each consumable can be accurately identified. For example, B0101 represents 84 disinfectant (specification: 500 ml/bottle), the coding rules include the production date and batch information, to realize the expiration date automatic warning.

3.2. Data-Driven Consumption Quota Standardization

A dynamic consumption quota management mechanism has been established

based on the two-dimensional measurement of historical data and clinical pathways:

Historical data modeling: Through regression analysis of historical consumable consumption data, combined with factors such as seasonal fluctuations and departmental expansion, the consumption is accurately predicted. For example, a tertiary hospital found a strong positive correlation between the consumption of printing paper in administrative departments and the number of people on duty, and predicted the consumption by combining this data.

Clinical pathway calibration: Based on the actual situation of clinical departments, consumable rationing standards linked to DRG patient group operation specifications were established. For example, the consumption of post-interventional care packs in the cardiology department is weighted and corrected according to the type of procedure and complications.

3.3. Resource Optimization Allocation by ABC Classification Method

Based on Pareto's law, low value consumables are categorized into A, B and C according to the consumption value and frequency for control:

Class A key control (70% of the total value of the first 5% of categories): such as high-value equipment accessories, special cleaning agents, etc., the implementation of "two-person acceptance + RF tracking + weekly inventory" system.

Class B routine management (20% categories accounting for 25% of the total value): such as bulk stationery, general disinfection supplies, etc., using "quantitative procurement + monthly audit" mode.

Class C simplified management (75% of the total value of 5% of the categories): such as cotton swabs, garbage bags and other low-value goods, the implementation of the "annual framework agreement + departmental self-application" mode.

Figure 3 shows the structure of the hospital's framework for fine-tuning the management of low-value consumables.

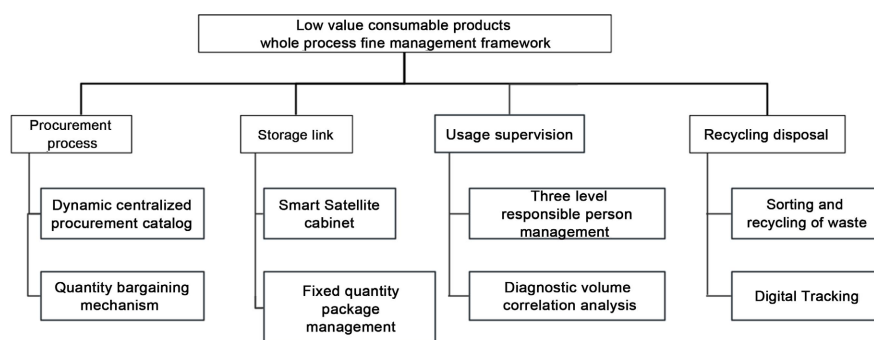


Figure 3. Low-value consumable products whole process fine management framework.

4. The Key Links to Optimize the Strategy

4.1. Procurement

The procurement of low-value consumables in public hospitals faces the problems

of “scattered, chaotic and expensive”. To this end, it is necessary to establish a dynamic centralized purchasing catalog, including consumables with an annual purchase volume of 80% of the TOP, and updating the catalog on a quarterly basis, eliminating low usage rates. At the same time, the implementation of the band-volume bargaining mechanism, combined with the historical procurement volume to adopt a ladder price reduction strategy, to promote the procurement alliance of regional medical associations, through the band-volume negotiation to realize the procurement cost reduction.

4.2. Warehousing

In order to improve the storage efficiency, it is proposed to reconstruct the storage network layout, upgrade the function of the central warehouse, apply SLAM technology to enhance the storage density, and deploy the environmental monitoring system to safeguard the storage conditions of disinfectants. The department deploys intelligent satellite cabinets, implements the fixed number package management mode, ensures accurate claiming through face recognition and work badge authentication, and automatically associates HIS system records. This effectively improves the intelligent level of inventory management.

4.3. Supervision of Use

A three-tier responsible person management system has been established through a fixed-person, fixed-post responsibility system to ensure the implementation of responsibilities at all levels. With the help of the traceability mechanism, the records of receipt and use are incorporated into the integrity files of the hospital, so as to raise the awareness of responsibility and reduce the risk of violation. At the same time, it develops diagnosis and treatment volume correlation analysis models, sets standard consumption volume intervals through DRG patient group consumables cost control tools, effectively standardizes the use of consumables, and reduces unnecessary over-consumption.

4.4. Recycling and Disposal

In order to improve the management effect of low-value consumables, it is necessary to strengthen the refined management of the recycling and disposal process. Specific practices include strengthening the classification and recycling of waste, regularly checking the expiration status of consumables, and carrying out real-time monitoring and tracking through digital means to ensure that the recycling process is transparent and efficient, to reduce the waste of resources and to improve the recycling rate of materials.

5. Implementation Guarantee Mechanisms

5.1. Organizational Structure Reform

Organizational structure reform is the basis for promoting the refined management of low-value consumables. First, the Consumables Management Committee

is established as a core platform for decision-making and coordination to ensure uniform planning and efficient implementation of consumables management. The committee is composed of the heads of all relevant functional departments, responsible for formulating policies, supervising implementation, and regularly evaluating management effects to ensure that measures are put into effect. Secondly, specialist consumable administrator positions are set up to clarify the responsibilities and management scope of the specialist level, and to be dedicated to the procurement, use, inventory and disposal management of all types of consumables, so as to enhance the refinement and specialization of management. These administrators will become the direct executors of hospital consumables management, responsible for daily operation and effective tracking and monitoring. Finally, a cross-departmental collaboration mechanism is established to break down the original functional barriers and promote the seamless integration of procurement, warehousing, utilization and recycling. Efficient transfer of information flow and optimization of resource allocation are achieved through regular communication and information sharing among all relevant departments. This mechanism ensures synergistic cooperation among the procurement, use and recycling segments of the consumables management process, further enhancing management efficiency and resource utilization. Through this series of structural reforms, an effective management chain can be formed to promote the development of low-value consumables management in the direction of more refinement and standardization.

5.2. Performance Appraisal System

Performance appraisal system is an important guarantee to ensure the effectiveness of low-value consumables management. First of all, the proportion of consumables is included in the departmental KPI assessment, setting specific targets for the use of consumables and urging the department to ensure the quality of medical care while controlling costs. By quantitatively evaluating the use of consumables in each department, the department is incentivized to comply with the norms and improve the efficiency of resource use. Secondly, a savings incentive fund is set up to link the cost savings or efficiency improvement measures of each department with the incentives, to stimulate the department's motivation in consumable management and to promote the construction of a conservation-oriented hospital. Finally, management effectiveness audits are carried out to conduct regular audits of the procurement, use, storage and recovery of consumables to assess the compliance and efficiency of the management process. Problems are identified and rectified through audits to ensure the implementation and sustainability of the management system. This system promotes the optimal allocation of the hospital's overall resources and the improvement of management effectiveness through a multi-dimensional assessment mechanism.

5.3. Continuous Improvement Mechanism

The continuous improvement mechanism promotes the dynamic optimization of

low-value consumables management through the PDCA management cycle. Firstly, the PDCA (Plan-Do-Check-Act) management cycle is established to ensure that each link is continuously improved in the implementation, forming a closed-loop feedback. Second, we develop a management cockpit data dashboard to visualize key data on consumables management and monitor various indicators in real time, such as procurement costs and inventory turnover, to help managers make quick decisions and adjustments. Finally, special process optimization is carried out on a regular basis to carry out thematic research and improvement of weak links in management, optimize processes by combining technological means, and improve management efficiency and resource utilization. Through continuous improvement in these three areas, we promote the construction of a long-term mechanism for the management of low-value consumables in hospitals to ensure that the management level is constantly improved.

5.4. Increasing Implementation Challenges and Coping Strategies

In the process of implementing refined management, the initial stage will face problems such as data silos, difficulty in system integration, and staff resistance. For example, some departments were unfamiliar with the new classification and coding system and the use of smart devices, resulting in low initial implementation efficiency. To solve these problems, the hospital was required to organize several rounds of training to help staff become familiar with the new management processes and smart devices. At the same time, by setting up a savings incentive fund, the departments were motivated to actively participate in the refined management, which ultimately led to the smooth implementation of the management model.

6. Policy Synergy and Industry Standardization

The refined management of low-value consumables not only depends on the optimization of the hospital's internal management system, but also requires the support of policies and regulations and the improvement of industry standards. Government departments, industry associations and hospital managers need to work together to promote policy synergy and standardization construction to ensure the sustainability and popularity of the management model.

6.1. Policy Guidance and Optimization of Regulatory Mechanisms

Government authorities can introduce relevant policies to promote the establishment of a refined management system for hospitals in procurement, use and recycling. For example, through the reform of medical insurance payment, the rational use of low-value consumables will be included in the hospital performance appraisal system to raise the importance of hospital managers. At the same time, the establishment of the industry supervision mechanism for the management of low-value consumables, regularly carry out special audits to prevent excessive procurement, illegal use and other problems.

6.2. Construction of Industry Standard System

At present, the domestic low-value consumable management standard is not perfect, there are problems such as non-uniform classification code in each hospital, and large differences in the management process. Therefore, a nationally unified classification and coding standard for low-value consumables should be established to ensure data compatibility across hospital districts and organizations and improve the efficiency of resource deployment. At the same time, the development of consumables consumption quota guidance standards, for hospitals to provide a scientific basis for the refinement of management.

6.3. Inter-Hospital Synergy and Experience Promotion

Through regional medical consortiums and specialty alliances, public hospitals can promote synergistic cooperation in the management of low-value consumables, establish a shared procurement platform, and enhance the bargaining power of large-scale procurement. At the same time, regular experience exchange and training will be conducted to promote excellent cases of refined management and enhance the overall management level of the industry.

The promotion of policy synergy and standardized construction provides institutional guarantee for the refined management of low-value consumables, which helps build a more scientific, reasonable and efficient management system, thus promoting the high-quality development of public hospitals.

7. Continuous Optimization and Promotion of Management Mode

The refined management of low-value consumables is a continuous optimization process, which needs to be combined with the operational needs of hospitals, technological development trends and industry management standards, and continuously improve and promote the management model adapted to different scales and types of hospitals.

7.1. Individualized Management Mode Adapted to Different Hospital Scales

Differentiated low-value consumables management programs are developed for the different characteristics of large tertiary hospitals, regional central hospitals and primary hospitals. Large hospitals can prioritize the use of information technology and intelligent means for full-process control, while grassroots hospitals can adopt a relatively simplified and refined management model, such as regional centralized purchasing + quota management, to improve management efficiency while reducing implementation costs.

7.2. Introduction of New Technologies and Application Expansion

With the development of AI, big data, blockchain and other emerging technologies, the management of low-value consumables can further evolve in the direc-

tion of intelligence and automation. For example, AI intelligent identification technology can be used for automatic identification and statistics of consumable inventory, and blockchain technology can be used for transparent supply chain management to ensure procurement process compliance and improve the traceability of procurement data.

7.3. Quantitative Assessment of Management Effect and Continuous Improvement

Through the establishment of a quantitative assessment system of management effect, the cost saving rate, inventory turnover rate, procurement compliance and other indicators of low-value consumables management are monitored in the long term, and the management strategy is optimized on a regular basis.

Through the continuous optimization and promotion of the management model, public hospitals can gradually build a more perfect low-value consumable management system, maximize resource utilization, improve the overall operational efficiency of hospitals, and provide a replicable and promotable paradigm for the modern management of the medical industry.

8. Conclusion

This paper successfully improves the management efficiency of low-value consumables in public hospitals, reduces the waste of resources, and realizes significant cost savings by constructing a data-driven low-value consumable whole-process refinement management model, combined with the support of the intelligent platform. The model provides a replicable management paradigm for other public hospitals and has high promotion value.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Yang, S.L., Ding, S., Gu, D.X., *et al.* (2021) Medical Networking: Healthcare Model Change and Innovative Development in the New Era. *Journal of Management Science*, **24**, 10-11.
- [2] Chen, H., Zhao, X., Jiang, Z.H. (2024) Exploration of the Path of Fine Operation and Management in Digitally Empowered Hospitals. *China Health Industry*, **21**, 227-231.
- [3] Zhao, Q. (2025) Exploration of Fine Management of Medical Consumable Materials in Hospitals. *Continuing Medical Education*, **39**, 157-160.
- [4] Wang, B.-S., Wang, J.-M., Peng, D.-C., *et al.* (2007) Transformation and Practice of Medical Quality Management Model in Digital Hospitals. *China Hospital Management*, **27**, 12-14.
- [5] Xiang, C.M. (2019) Introduction to the Utilization of Interconnection Concept in Hospital Information Management. *Information Systems Engineering*, No. 9, 68-68.