



Exploring Rational Management Methods for Medical Consumables

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Abstract: Purpose—The purpose of this article is to explore methods for the rational management of medical consumables, with the aim of providing reference for the future management of medical consumables. Methods—The hospital where the author is affiliated implemented a classification coding consumables management model in January 2021. Statistical analysis was conducted on the usage data of medical consumables for the full year of 2020 and 2021. The application effectiveness of the classification coding consumables management model in the workplace was evaluated. Results—In the third quarter and fourth quarter of 2021, the percentage of medical consumables usage per hundred yuan was 24.6% and 18.4%, respectively, both lower than 26.0% and 26.3% in 2020, with statistically significant differences ($P < 0.05$). Compared to the year 2020, the total amount of medical consumables in 2021 increased by 21.2%, and the amount of high-value consumables increased by 40.4%, with an increase of 4.5% in the number of high-value consumable types. After comparing 300 cases of medical consumables sampled for each quarter, the rates of irrational usage in the second, third, and fourth quarters of 2021 were 14.0%, 12.7%, 11.7%, and 7.0%, respectively, all lower than 18.7% in 2020, with statistically significant differences ($P < 0.05$). Conclusion—The management of medical consumables through classification coding can effectively control the percentage of medical consumables usage per hundred yuan, facilitate the control of various types of consumables, and increase the total revenue of medical consumables while reducing the rate of irrational usage.

Keywords: medical consumables, rational usage, management, lean management model

1. Introduction

The management of medical consumables is an essential aspect of hospital logistics management. With the continuous development of modern medical technology and the increasing variety and quantity of medical consumables, the difficulty of managing medical consumables in hospitals has also increased [1]. Currently, there are various forms of classification for medical consumables, and there is no unified standard. For example, managing medical consumables in military hospitals requires separate classification and management for military standards and provincial standards. Furthermore, differences in hospital scale and level result in different management methods for medical consumables [2-3]. Therefore, researching rational management measures for medical consumables is conducive to effective management in the future. In China, the proportion of medical consumables varies greatly among different tertiary hospitals in different regions. In some exceptional cases, hospitals may have proportions exceeding 30%. High-value consumables can account for over 50% of the total revenue from medical consumables, which is one of the main factors leading to the difficulties and high costs of healthcare for patients [4-5]. This study primarily focuses on the management methods for medical consumables in the author's affiliated hospital, with the aim of providing insights for future consumables management.

2. Research Data and Methods

2.1 Research Data

The research data for this study consisted of the usage data of medical consumables for the entire year of 2020 and 2021 from the author's affiliated institution. This data encompassed 20 categories, including interventional consumables, orthopedic consumables, low-value consumables, reagents, medical films, and others, totaling 11,073 different brand and model types. Statistical analysis was conducted to assess the application effectiveness of the classification coding consumables management model in the workplace.

2.2 Inclusion and Exclusion Criteria

All medical consumables included in this study accounted for 80% of the total usage. The data included complete information related to consumable procurement, cost revenue, usage quantity, and clinical utilization. Data were organized and summarized using the hospital's HIS (Hospital Information System). Consumables with a monthly usage increase-to-

medical revenue increase ratio exceeding 2 were excluded, as were consumables with incomplete usage data or information.

2.3 Methods

First, the inventory of various consumables was categorized, and the ABC classification method was applied to distinguish consumables of different values. The specific steps were as follows: ①Based on data such as the purchase price and inventory quantity of hospital consumables, calculate the purchase amount. ②Use the purchase amount to rank the consumables in descending order of value. ③In the hospital's consumable management platform, calculate the cumulative total amount, cumulative amount percentage, and number of consumable types for each consumable, resulting in an ABC classification table, including details such as commonly used hospital consumables and purchase amounts. Next, the CVA grading method was used to classify urgently needed consumables, including items such as emergency tracheal intubation, central venous catheters, and emergency respiratory bags. Consumables were divided into four levels, with Level 1 being the highest priority, Level 2 as high priority, Level 3 as medium priority, and Level 4 as low priority. Management personnel were then tasked with prioritizing different categories of consumables. Class A and Level 1 consumables required daily inventory checks, Class B and Level 2 consumables should be checked weekly, Level 3 consumables monthly, and other Class C consumables were checked quarterly. During each inventory check, it was essential to ensure the accuracy of records, verify the quality of stocked consumables, check production dates and expiration dates, and inspect for any expired, spoiled, or damaged items. Any abnormalities were promptly addressed, reported, and documented. All consumables were categorized and stored, primarily in the Medical Equipment Department's storeroom, operating room storeroom, and supply room storeroom.

2.4 Evaluation Metrics

(1) Statistical analysis was conducted on the usage rates of medical consumable categories per hundred yuan for the first quarter, second quarter, third quarter, and fourth quarter of both years. This refers to the percentage of medical consumable categories (based on revenue) within the total categories of medical consumables.

(2) The total amount of medical consumables (excluding drug revenue), the amount of high-value consumables, and the number of high-value consumables for the years 2020 and 2021 were separately calculated. Growth rates were determined using the following formula for total medical consumable amount as an example: $(\text{Total medical consumable amount in 2021} - \text{Total medical consumable amount in 2020}) / \text{Total medical consumable amount in 2020} \times 100\%$.

(3) To investigate the rational usage of medical consumables, 300 random samples of medical consumables were selected for each quarter in both years. The usage of these consumables was investigated, and the analysis included assessing the non-compliance of consumables. The rate of irrational medical consumable usage was calculated as the proportion of non-compliant consumables to the total sampled.

2.5 Statistical Analysis

Data collection and initial processing for this study were conducted by the author personally, initially using Epi Data 3.1 software for validation. Subsequently, data were imported into SPSS 24.0 statistical processing software. Categorical data were recorded as "n(%)" and analyzed using χ^2 test, while normally distributed continuous data were recorded as " $\bar{x} \pm s$ " and analyzed using the t-test or F-test. The significance level for statistical tests was set at $P < 0.05$, indicating that differences in data comparisons were statistically significant.

3. Results

3.1 Analysis of the Percentage of Medical Consumable Categories per Hundred Yuan for Two Consecutive Years

In the third quarter and fourth quarter of 2021, the percentage of medical consumables per hundred yuan was 13.91% and 14.60%, respectively. These figures were both lower than those for the corresponding periods in 2020, which were 14.10% and 16.3%. The differences were statistically significant ($P < 0.05$). See Table 1.

Table 1. Comparison of the Percentage of Medical Consumable Categories per Hundred Yuan for Different Quarters in Two Consecutive Years [n(%)]

Time	Quantity	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Year 2020	11073	2890 (13.06)	2808 (14.49)	2875 (14.1)	2911 (16.3)
Year 2021	11073	2812 (13.7)	2693 (13.65)	2729 (13.91)	2070 (14.6)
χ^2 Value	-	1.437	3.199	5.092	183.201
P Value	-	0.231	0.074	0.024	0.000

3.2 Growth Rates of Medical Consumable Amount, High-Value Consumable Amount, and Number of High-Value Consumable Types for Two Consecutive Years

Compared to the year 2020, the total amount of medical consumables in 2021 increased by 4.97%. However, the amount of high-value consumables decreased by 12.22%, while the number of high-value consumable types increased by 4.5%. See Table 2.

Table 2. Analysis of the Growth Rates of Medical Consumable Amount, High-Value Consumable Amount, and Number of High-Value Consumable Types for Two Consecutive Years

Time	Total Medical Consumable Amount (ten thousand yuan)	High-Value Consumable Amount (ten thousand yuan)	Number of High-Value Consumable (Types)
Year 2020	16475.1	6280.5	3110
Year 2021	17295.2	5512.1	3250
Growth Rate	4.97%	-12.22%	4.5%

3.3 Analysis of Irrational Usage of Medical Consumables for Two Consecutive Years

After comparing 300 randomly selected cases of medical consumables for each quarter, the rates of irrational usage in the second, third, and fourth quarters of 2021 were 14.0%, 12.7%, 11.7%, and 7.0%, respectively. These rates were all lower than those for the corresponding quarters in 2020, which were 18.7%, 18.7%, and 18.7%. The differences were statistically significant ($P < 0.05$). See Table 3.

Table 3. Comparison of Irrational Usage of Medical Consumables for Two Consecutive Years [n(%)]

Time	Cases	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Year 2020	300	57 (19.0)	56 (18.7)	56 (18.7)	56 (18.7)
Year 2021	300	42 (14.0)	38 (12.7)	35 (11.7)	21 (7.0)
χ^2 Value	-	2.722	4.087	5.713	18.251
P Value	-	0.099	0.043	0.017	0.000

4. Discussion

The variety, usage, and functions of medical consumables continue to become more specialized and diversified, placing increasing difficulty and pressure on hospitals in consumables management. Some healthcare institutions have faced issues such as "inventory backlog," "shortages," and "consumables management occupying healthcare staff's time" [7-8]. With ongoing healthcare system reforms and the unexpected challenges posed by the recent pandemic, the role of medical consumables in modern healthcare has become increasingly prominent. Outdated and inefficient management models with deficiencies in inventory management are no longer suitable for the evolving demands of medical consumables management [9-10]. Therefore, strengthening the management of medical consumables to ensure cost-effective hospital operations has become a focal point of hospital management [11].

Analyzing medical consumable usage data allows for real-time monitoring of the specific utilization of consumables, enabling more scientific and standardized clinical usage. In this study, an analysis was conducted on the situation before and after the implementation of the classification coding management of consumables in our hospital. The data showed that in the third and fourth quarters of 2021, the percentage of medical consumables per hundred yuan was 13.91% and 14.60%, respectively. These percentages were both lower than those in 2020, which were 14.10% and 16.3%, with statistically significant differences ($P < 0.05$). At the beginning of the implementation of this management model in the first and second quarters, there were no significant differences in the data, but they gradually decreased. This indicates that the classification coding management of consumables is beneficial for controlling the usage of low-value medical consumables. By categorizing consumables in different varieties, categories, and grades, it is possible to effectively reduce inventory levels and capital utilization. This promotes the efficiency of relevant personnel and the economic benefits of the hospital [12]. High-value medical consumables have characteristics such as strong specialization, significant individual usage differences, numerous product specifications, and rapid updates. These factors pose many management challenges in terms of pricing, usage, and circulation. After the implementation of the classification coding management of consumables in our hospital in 2021, compared to 2020, the total amount of medical consumables increased by 4.97%, while the amount of high-value consumables decreased by 12.22%, and the number of high-value consumable types increased by 4.5%. After comparing 300 randomly selected cases of medical consumables for each quarter, the rates of irrational usage in the second, third, and fourth quarters of 2021 were 14.0%, 12.7%, 11.7%, and 7.0%, respectively, all lower than those in 2020, with statistically significant

differences ($P < 0.05$). This further illustrates the advantages of the classification coding management of consumables in enhancing consumable management, effectively controlling the rate of irrational usage, and contributing to the hospital's efficient operation and sustainable development [13]. Additionally, through advanced information technology platforms and big data management, we have gained a basic understanding of the structure of our hospital's consumable usage data and changes in consumables. This is conducive to providing guiding data for consumable management. It is worth noting that due to various factors and the differences in different regions and levels of hospitals, the effectiveness of controlling the percentage of medical consumables varies. This will be one of the key research areas in hospital management in the future [14-15].

In summary, the use of classification coding for the management of medical consumables can effectively control the percentage of medical consumables per hundred yuan, facilitate the management of various types of consumables, enhance the total revenue of medical consumables, and reduce the rate of irrational usage. This approach is conducive to the establishment of standardized clinical pathways and the promotion of standardized diagnostic and treatment practices.

References

- [1] Hou Wei, Bai Mei. A retrospective analysis of the use of low-value medical consumables in hospitals and exploration of management[J]. *China Medical Equipment*, 2016, 31(4): 122-125.
- [2] Zhao Rong, Xia Haiming. Research on the use of high-value medical consumables in Nanjing area and medical insurance payment[J]. *Modern Instruments and Medical Treatment*, 2021, 27(5): 4-8.
- [3] Zhang Bing, Xu Benshi, Feng Ya, et al. Promotion of the coordinated development of the three links of procurement, use, and bidding of medical consumables in Nantong[J]. *China Medical Insurance*, 2020(7): 26-28.
- [4] Yao Hui, Sun Gang, Miao Jiaqing, et al. Study on the effectiveness of rational use of medical consumables in a Grade III hospital under the background of medical reform[J]. *China Hospitals*, 2020, 24(1): 30-31.
- [5] Xiang Hua, Zhang Hehua, Liu Xianghua, et al. Discussion on the management method of rational use of medical consumables[J]. *Medical and Health Equipment*, 2020, 41(6): 90-92.
- [6] Chang Huanhuan, Zhou Hailong, Yu Lihua. Ideas and considerations for establishing a classification coding system for medical consumables in China[J]. *China Health Economics*, 2018, 37(6): 59-61.
- [7] Gao Feng, Liu Yan. Analysis of the use of high-value medical consumables in 56 hospitals in a city[J]. *Modern Hospital*, 2021, 21(5): 750-753.
- [8] Chen Weiwei. Investigation and suggestions on the management of high-value medical consumables in municipal hospitals in Nanjing[J]. *Medical and Health Equipment*, 2017, 38(10): 139-141.
- [9] Gao Feng, Liu Yan. Analysis of the use and management of 18 categories of high-value medical consumables in 40 tertiary hospitals[J]. *Popular Science and Technology*, 2021, 23(9): 163-166.
- [10] Shang Penghui, Fang Zheng, Li Na. Analysis and countermeasures for the problem of excessive use of high-value medical consumables[J]. *China Health Policy Research*, 2018, 11(12): 7-11.
- [11] Nabelsi, Veronique, Gagnon, Stephane. Information technology strategy for a patient-oriented, lean, and agile integration of hospital pharmacy and medical equipment supply chains[J]. *International Journal of Production Research*, 2017, 55(13/14): 3929-3945.
- [12] Wu Guannan, Li Jiawen, Zhang Ping, et al. Analysis and research on risk management in the clinical use stage of medical consumables[J]. *China High-Tech Zone*, 2019(17): 256.
- [13] Yin Jun, Liu Xianghua, Yan Lexian, et al. Discussion on the use and control of medical consumables under the guidance of medical insurance policies[J]. *China Medical Equipment*, 2019, 34(1): 142-145.
- [14] Wang Dongmei. Problems in the use and management of medical consumables in hospitals and suggestions for improvement[J]. *Administrative Assets and Finance*, 2016(15): 13, 12.
- [15] Qin Xueli, Li Yuanlei. Discussion on the calculation method of the utilization rate of non-fee medical consumables[J]. *China Medical Equipment*, 2017, 14(3): 52-54.