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The Application Effect of "Expiration Manager" Mini Program in the Validity Management of Articles in Ward

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Abstract: The purpose of this study is to investigate the effectiveness of the "expiration manager" mini program in managing the validity of ward items. The program was used to manage frequently and infrequently used consumables by setting up an automatic reminder function. The item failure rate and the time required for nurses to conduct counts over 6 months before and after implementation were compared, as well as evaluated system availability using the System Usability scale (SUS). Results showed that after implementing the mini program, both the item failure rate and non-recognition rate significantly decreased ($P < 0.05$), while the inspection pass rate significantly increased ($P < 0.05$), and the monthly inventory time was reduced ($P < 0.05$). The SUS evaluation yielded a total score of 74.38 ± 11.73, with learnability at 80.21 ± 20.27 and availability at 72.92 ± 11.18, all indicating good user acceptance. In conclusion, the "expiration manager" mini program can effectively improve the efficiency of item expiration management, reduce the risk of expiration, and save inspection time, thereby demonstrating high user acceptance and promising potential for wider adoption.

Keywords: "Expiration manager" mini program; Medical articles; Validity period management; Information application

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1. Introduction

The management of the expiration date of medical supplies is crucial for ensuring medical safety and improving nursing quality. However, traditional manual management methods have a wide variety of items with different expiration dates and registration times that are not arranged in order, resulting in cumbersome and time-consuming inspection results. Nurses find it difficult to balance the expiration date inspection of items with daily care work, leading to expired items and potential safety hazards. With the rapid development of information technology, various mobile mini programs have emerged, providing new solutions for item expiration management [1]. As a countdown mini program based on the WeChat platform, "Validity Manager" has gained attention in the medical

field due to its advantages of automatic reminders, strong visualization, easy operation, and real-time sharing. The purpose of this study is to explore the application effect of the "expiry date manager" mini program in the expiry date management of items in the cardiovascular department, to provide scientific basis for improving the efficiency of expiry date management and reducing medical safety hazards.

2. Data and methods

2.1. General information

There are 56 beds in the cardiovascular medicine ward of the hospital, and 12 nurses are involved in the management of materials. There were 5 nurses in charge, 4 nurses, and 3 nurses involved in the management of articles [1]. By self-comparison method, the actual nurse-patient ratio during the day shift (1:9.05) and the night shift (1:16.40) was observed from April to September 2023 before the application of the "expiration manager" mini program. From October 2023 to March 2024, the actual day shift nurse-patient ratio (1:9.03) and night shift nurse-patient ratio (1:15.90) were obtained after the application of the "expiration manager" mini program. There was no significant difference in the number of nurses in the department, their professional titles, the actual nurse-patient ratio, and the types of goods before and after the implementation ($P > 0.05$).

2.2. General management methods

A manual inspection method is employed, wherein A1 class nurses conduct weekly checks of the validity periods for all items. On the first day of each month, a validity management specialist performs a comprehensive verification, marking and registering items that are approaching expiration (within six months). Additionally, the head nurse conducts random checks periodically to ensure effective management [2]. After October 2023, the "expiration manager" mini program will be used to manage the items in the ward. All nurses in the department would undergo training on the operation of the "expiration manager" mini program. This training will ensure that every nurse can proficiently use the system and recognize the importance of effective validity management of goods [3]. A total of 52 items are included in the management, including commonly used items in the rescue vehicle (such as blood test tubes, central vein catheters, etc.) and non-commonly used consumables outside the rescue vehicle (such as spare ventilators, disposable drainage devices, etc.) [4].

The WeChat account of the "expiration manager" is designated as the department's official account for registering and logging into the mini program. Upon the first use, the system will enter a setup interface, a process jointly completed by the regional nurse in charge and the validity management specialist to ensure accurate data entry. The input information includes the item name, current quantity, unit, production date, and shelf life. The system will then automatically sort items based on their expiration date.

Users can configure the "Subscription Reminder Sending Time" by selecting notifications to be sent "1 day in advance", "7 days in advance", "30 days in advance" and "180 days in advance" in advance, based on their needs. For this study, the reminder is set for 180 days before expiration, allowing timely placement of warning labels on items nearing expiration. Once all data is entered, the system automatically saves and displays it in the corresponding list [5]. Additionally, access is granted to all nurses in the department, ensuring real-time tracking of item expiration status.

Class A1 nurses use the mini program to check the validity of items weekly and manually verify the expiration dates of commonly used supplies in the department. The validity management specialist conducts a

comprehensive monthly review to ensure consistency between the mini program records and the actual expiration dates. If discrepancies are found, the physical expiration date takes precedence, and the system is updated accordingly. Additionally, the head nurse performs irregular spot checks each month to ensure the effectiveness of validity management.

3. Evaluation indicators

3.1. The effect of article validity management

Compare six months before and after the use of the "expiration manager" mini program, the department's item failure rate, the near-validity item warning label rate, the inspection pass rate, and other indicators [6].

The specific calculation formula is:

(1) Item failure rate = the number of expired items/the total number of inspections × 100%;

(2) Near-effect item unrecognized rate = near-effect item unrecognized times/total number of inspections × 100%;

(3) Inspection pass rate = (total number of inspections - number of expired items - number of no warning marks)/total number of inspections × 100%

Supervision of article validity management is conducted through hospital-organized inspections, including night shifts, holidays, and evaluations by the nursing safety team. The compliance rate before and after implementing the "expiration manager" mini program is recorded. The hospital conducts night shift and holiday inspections 1–2 times per week, while the nursing safety team performs a quarterly inspection.

3.2. Time required for item validity inventory

Before and after using the mini program of "expiration manager", the nurse should count the time required by minutes per month to check the validity period of articles in the ward. Before its use, the total time consists of the weekly inspection time plus the monthly inspection time. After implementing the mini program, the total time includes the weekly inspection time, the monthly inspection time, and the additional time required to modify item validity within the program.

3.3. Applet usability evaluation

Brooke's system usability scale (SUS) was used to evaluate user acceptance [7]. There are 10 items in the scale with a test reliability of 0.91, where odd-numbered items are positive statements and even-numbered items are negative statements. The scale ranges from 1 to 5, from strongly disagree to strongly agree. The total score of SUS is calculated by the following formula: Total score of SUS = (score of odd sigma × 2.5 + score of even sigma × 2.5) / 10, where score of odd sigma is (X−1) × 2.5 and score of even sigma is (5−X) × 2.5. The higher the SUS score, the better the user acceptance. SUS score ≥ 70 indicates good user acceptance, while SUS score < 50 indicates unacceptable user acceptance.

3.4. Statistical Processing

SPSS25.0 software was used for statistical analysis of the data. The measurement data were $x \pm s$, and the t-test of two independent samples was used for comparison between groups. The counting data were expressed as a percentage and the comparison between groups was performed by χ^2-test. $P < 0.05$ was considered statistically significant.

4. Results

4.1. Effect of item validity management

After implementing the "expiration manager" mini program, the department experienced a significant decrease in both the failure rate of articles and the unrecognized rate of items nearing their expiration. Additionally, the qualified rate of supervision and inspection showed a significant improvement ($P < 0.05$). See **Table 1** for details.

Table 1. Effect of item management before and after implementation [n(%)]

	Number of times	The number of expired items	The number of unrecognized near-expired items	Supervise the number of qualified items
Pre-implementation	42	6 (14.3)	11 (26.2)	25 (59.5)
Post-implementation	41	0 (2.4)	3 (7.3)	38 (92.7)
χ^2		4.363	5.270	12.472
P		0.037	0.022	<0.001

4.2. Time required for item inventory

After the implementation of the mini program, the monthly inventory time of nurses was reduced from (161.17 ± 11.89) minutes to (114.83 ± 5.91) minutes, with significant difference ($P < 0.001$) as shown in **Table 2** below.

Table 2. Comparison of inventory time before and after implementation (x ± s)

Groups	*N*	Time spent (min) on inventory per month
Before implementation	6	161.17 ± 11.89
After implementation	6	114.83 ± 5.91
T-value		8.547
P value		< 0.001

4.3. Evaluation of system availability

Based on the SUS scale evaluation, the total score of the system is (74.38 ± 11.73), the learnability score is (80.21 ± 20.27), and the usability score is (72.92 ± 11.18), all of which are higher than 70 points, indicating that the mini program has a good user acceptance.

5. Discussion

5.1. Accurately control the validity period of items to ensure medical safety

The effect of expiry management of medical supplies is closely related to the quality of nursing care [8]. In this study, the effect of expiry management of medical articles in ward was improved by using the mini program "expiration manager". The failure rate of articles decreased significantly from 14.3% to 2.4%, the unrecognized rate of articles in the near effect period decreased from 26.2% to 7.3%, and the qualified rate of inspection increased from 59.5% to 92.7%, with statistical significance ($P < 0.05$).

The small program automatic reminder function notifies nurses in advance 180 days before the item is close to the expiration period so that they have enough time to replace or warn the mark, to effectively avoid the use of

expired items. However, under the traditional management method, nurses need to rely on memory and manual inspection, which is not only a large workload but also prone to errors, resulting in an increased risk of expired items [9].

At the same time, through the visual interface and real-time update function of the small program, nurses can see the expiry status of the items at a glance, find and deal with the near-expiry items in time, and carry out warning marks. However, under the traditional management method, the records are scattered, and the update is not timely, which often leads to the omission or misuse of the near-effect items [10]. Therefore, the application of "expiration manager" mini-program can significantly improve the effectiveness of the expiration management of ward items.

5.2. Reduce inspection time and improve work efficiency

In the traditional management method, nurses need to spend a lot of time and energy to check and record the validity of items one by one, which affects the daily work efficiency of nurses. In this study, the introduction of the "expiration manager" mini program significantly improved the efficiency of the item validity management, reduced the inspection time and improved the work efficiency.

The time required by nurses to check the validity period of articles was shortened from the monthly average of (161.17 ± 11.89) minutes to the monthly average of (114.83 ± 5.91) minutes, the difference was statistically significant ($P < 0.05$). Before implementation, nurses need to manually check the validity period of each item and calculate the time before expiration, which is a heavy and tedious workload. After the implementation of the "expiration manager" mini program, the nurse can clearly and conveniently check the validity status of "infrequently used consumables outside the rescue cart" and "rescuing items in the cart" through the mini program, quickly understand the number of days from the expiration date, reduce the workload of nurses and save the inspection time.

At the same time, through the main interface of automatic sorting in the mini program, nurses can quickly locate the near-effect items and their location, reducing invalid inspection and repetitive labor [11]. Secondly, the mini program simplifies the entry and update process of the item validity information. When updating the item validity period each time, you only need to directly change the time, without changing other settings. The maintenance time in the later period is greatly reduced, and the work efficiency is improved [12].

5.3. Apply the "expiration manager" mini program to carry out the items' validity management precautions

Not all items requiring expiration management should be entered into the "expiration manager" mini program. Some sterile items have large usage and fast turnover. If these items are entered, the expiration date needs to be updated constantly, which will increase the workload of nurses [13–14]. Therefore, it is necessary to combine the actual situation of the ward, choose the ward that is not often used, and use the items that are easy to miss. In the setting of reminder time, any time can be chosen according to the hospital system, "remind 180 days in advance" is suggested as it facilitates the pasting of warning labels and timely replacement.

To ensure standardized management, it is recommended that registration be done using the mobile phone account of the designated validity period administrator. Only this administrator has the permission to make modifications, while other personnel cannot alter the data. If any modifications are required, they can be requested through the WeChat group [15]. Additionally, the "expiration manager" mini program does not replace the need for

a comprehensive monthly inspection of all physical validity periods. During these checks, the recorded data in the mini program should be cross-referenced with the actual validity periods to ensure accuracy and reliability.

6. Conclusion

To sum up, the application effect of the "expiration manager" mini program in the management of the validity period of ward items is remarkable, which not only significantly improves the effect of the management of the validity period of ward items, but also saves the inspection time. Therefore, the mini program is worthy of clinical wide application.

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Disclosure statement

The authors declare no conflict of interest.

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