Analysis of the application and practice of PDCA cycle in management of the naked medicine dispensing—the quality and safety of the drug

Original article

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Abstract: **Objective:** To explore the application of plan–do–check–action (PDCA) cycle in the management of the naked medicine dispensing about the automatic package and to analyze the practice improved in the quality of naked medicine dispensing medicine management. **Methods:** The PDCA theory was used to analyze the data, to find out the causes of the problem, and to formulate the corresponding countermeasures to intervene. The data of the naked medicine/adverse drug events satisfaction degree of the inpatients in 18 inpatient departments given for the adoption of PDCA cycle in January 2017 were set as the observation group. The number of the naked medicine/adverse drug events satisfaction degree of patients in 18 inpatient departments before adoption of PDCA cycle in December 2016 was set as the control group. The number of the naked medicine/adverse drug events satisfaction degree of patients in 18 inpatient departments before and after adoption of PDCA cycle was observed and analyzed. **Results:** The number of the naked medicine/adverse drug events after implementing the method of PDCA cycle management rate was significantly lower than before the implementation method of PDCA cycle management, and the difference had statistical significance ($P < 0.05$). The satisfaction degree of the inpatients after implementing the method of PDCA cycle management rate was significantly higher than that before the implementation method of PDCA cycle management, and the difference had statistical significance ($P < 0.05$). **Conclusion:** Application of PDCA cycle in the management of the naked medicine dispensing about the automatic package can help to reduce the adverse drug events, to improve the safety of drug treatment, and to increase the patients' satisfaction degree.

Keywords: PDCA cycle • the naked medicine dispensing • automatic medicine packing machine • quality and safety • drug administration

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1. Introduction

According to the terms 5.4.4 of *The implementation details of the accreditation standards for tertiary general hospital (2011 edition)*, the request was to establish the risk measure of the nursing, such as medication errors.

The issuance of oral medications is the guarantee of the accuracy in using the premise of oral medications.¹ The potential risk in the oral medications dispensing will delay treatment, even endanger the patient lives. So, oral administration is an important content in the patient safety. In order to ensure the patients taking

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their medicine accurately, in order to improve the clinical safety, it is immensely necessary must to establish the measure of potential safety hazard in the issue link for oral administration. Plan–do–check–action (PDCA)² circulation is a method of quality management proposed by Deming WE, a famous quality management expert. It includes four steps: P (Plan), D (Do), C (Check), and A (Action). The method has been widely applied in the management of quality in almost every field. This study is about the PDCA cycle in the management of naked drug dispensing.

2. Methods

2.1. Subject

The subject of this study was the number of bare drugs in the clinical department ward. The survey was calculated according to the medical ward, the surgical ward, and the intensive care unit. The medical ward involved 8 ward units, the surgical ward involved 7 ward units, and the intensive care unit involved 3 ward units. The daily average number of naked drugs in the medical ward, the surgical ward, and the intensive care unit, and the number of bare drugs in each period are shown in Table 1 below. Among them, the number of naked drugs in the six ward units of the medical ward is relatively large. Therefore, the daily average number of naked drugs in the six ward units of the medical ward and the number of bare drugs in each period are also shown in Table 1.

2.2. The method of PDCA

While taking the method of PDCA cycle, we check the situation of the automatic medicine packing machine and find out the reason of the naked medicine dispensing, develop a plan of PDCA cycle, take some improvement measures and put into action, the finally test the results. We compared the number of the naked

medicine/adverse drug event satisfaction degree of patients before and after adopting the method PDCA circulation. The followings are the main specific process.

2.2.1. Analysis

The data of the naked medicine/adverse drug event satisfaction degree of patients before 1 month of adopting the method of PDCA were analyzed, it was found that the main reason about the naked drug dispensing in the clinical practice is the current storage cannot preserve the easy oxidation drug, some expensive drugs did not go in the medicine packing machine. The clinically used and less expensive drugs have not entered the drug-packing machine; currently, the drug-packing machine cannot separately print a single-dose temporary drug package, and the pharmacy needs to be manually sorted. The practice of the peak flow medicine dispensing is lacking; the inspector of nursing and pharmacy department is not strict; the cooperation between various departments (pharmacy department, information department, nursing department, etc.) is lacking; the boot fee and charge material cost of the medicine packing machine are more expensive. Many reasons cause the automatic medicine packing and medicine dispensing the naked drug.

2.2.2. Plan

The training in the drug safety knowledge, especially complete information must be strengthened. According to the clinical demand, the naked drug dispensing into the ward was identified. The communication with the information department should be strengthened, the information settings about medicine packing machine should be improved. According to the statistics, the supervision of the nursing department and the pharmacy department is not strict; the cooperation between

Department	Average of all day	Daily time	Evening time
Medical ward	343.32 ± 17.258	139.46 ± 8.522	203.86 ± 12.171
Cardiology 1	65.89 ± 3.189	36.43 ± 3.023	29.49 ± 1.621
Cardiology 2	65.89 ± 8.582	16.79 ± 2.515	49.11 ± 8.439
Neurology	60.39 ± 8.350	31.36 ± 4.931	29.04 ± 4.940
Dyspepsia	28.64 ± 3.070	10.93 ± 2.493	17.71 ± 1.823
Oncology	41.64 ± 4.692	17.46 ± 2.349	24.18 ± 4.155
Respiratory	35.57 ± 5.554	10.64 ± 1.747	24.93 ± 5.504
Surgical ward	85.76 ± 6.192	41.46 ± 4.023	44.29 ± 3.276
Intensive care ward	59.395 ± 4.725	20.17 ± 1.671	39.25 ± 4.070

Table 1. The average number of naked medicine in all day and other each time zone (M ± SD)

the departments of the nursing department, the pharmacy department and the information department is lacking; the cost of the medicine machine and the cost of the medicine package are relatively expensive, etc. The machine implements a bare drug adjustment to the ward. The nurse education in the checking of clinical drug information should be strengthened and the safety in the management of drug therapy should be improved. A hospital-wide bare drug tracking statistical monitoring table, a drug tracking list of unincorporated drug-medicine machines, and timely feedback on the status and types of pharmacy naked drug dispensing should be established.

2.2.3. Check

An inspecting team was set up, the members of the inspection team examine the effect on the implementation of improvement measures at regular interval. The head of the inspecting team checked randomly. We checked the number of the increasing drugs types into the medicine packing machine, the amount and type of naked medicine dispensing, and the knowledge of medication safety.

2.2.4. Action

The intervention of tracking cycle was planned for a month. After 1 month, if the naked medicine dispensing is declined, we will put the management experience of PDCA cycle in the application of naked medicine. And the measures of the naked medicine are to be standardized and institutionalized. For the deficiencies, it is a basis and power for the next rectification, which will continue in the next management of PDCA cycle. PDCA cycle in the naked medicine dispensing management of automatic medicine packing machine raises the management consciousness of the drug in the medical staff and makes the rules on a regular basis.

2.3. Evaluation index

The data of the naked medicine/adverse drug event satisfaction degree of the inpatients before and after using the method of PDCA cycle management were analyzed.

2.4. Statistical methods

The SPSS 17.0 statistical software was adopted in this study. The categorical data were compared with χ^2 test, $P < 0.05$ was considered statistically significant.

3. Results

3.1. The quantity and classification statistics of the ward naked medicine

The quantity and classification of the ward naked medicine were satisfied before and after the implementation of PDCA circulation method. The naked medicine quantity after the implementation of PDCA cycle method management was obviously lower than before. The differences were statistically significant ($P < 0.05$), and the results of the survey are listed in Table 2.

3.2. The adverse drug events comparison before and after implementation of PDCA circulation method of management

The study found that the occurrence of the diverse drug events was eight times before adopting the PDCA cycle. After the PDCA circulation method of management, the occurrence of adverse drug events is one time and significantly lower than that before the PDCA cycle was applied. Compared with the control group, the difference was statistically significant ($P < 0.05$; Table 3).

Department	Time zone	Before PDCA	After PDCA	<i>t</i>	<i>P</i>
Surgical ward	All day	85.76 ± 6.192	14.32 ± 3.411	47.001	0.000
	Day time	41.46 ± 4.023	6.71 ± 2.016	64.026	0.000
	Evening time	44.29 ± 3.276	7.61 ± 2.043	74.240	0.000
Intensive care ward	All day	59.35 ± 4.725	9.82 ± 2.294	56.360	0.000
	Day time	20.17 ± 1.671	4.57 ± 1.451	42.318	0.000
	Evening time	39.25 ± 4.070	5.25 ± 1.206	41.811	0.000
Medical ward	All day	343.32 ± 17.258	68.07 ± 1.207	99.787	0.000
	Day time	139.46 ± 8.522	28.59 ± 3.445	55.607	0.000
	Evening time	203.86 ± 12.171	37.67 ± 2.746	66.305	0.000

Table 2. The average number of naked medicine before and after the PDCA cycle (M ± SD)

3.3. The inpatients satisfaction degree comparison before and after the implementation of PDCA circulation method of management in the drug dispensing

The study showed that the inpatients' satisfaction degree before using PDCA cycle management on drug dispensing was 96%. After using PDCA cycle, management on drug dispensing was 99%. The difference was compared with the control group and was statistically significant ($P < 0.05$; Table 4).

4. Discussion

4.1. Strengthening of the naked medicine management, and standardizing the medical safety system

The results of this study show that the reasons in the automatic medicine packing machine naked drug dispensing were the setting cannot temporary charge according to the patient information printing a single dose, the pharmacy needs to rely on manual sorting. The temporary dispensing medicines off-peak hours are more, and medicine packing machine boot fee and charge material costs are more expensive. Analyzing the reason by the PDCA circulation method, this research set up a special inspection team. Meeting by medical, nursing, pharmacy, and information departments to discuss the solutions. Regulation of the clinical doctors submitting the doctor's advice in a few peak times, writing orders, tracking the table in the naked medicine distribution in each department. It is stipulated that clinicians should submit medical orders in

Department	Before PDCA	After PDCA
Medical ward	5	1
Surgical ward	2	0
Intensive care ward	1	0
Total	8	1

Table 3. The events related to drugs before and after the PDCA cycle

Department	Before PDCA	After PDCA	<i>t</i>	<i>P</i>
Medical ward	93.59 ± 1.217	98.41 ± 1.152	8.370	0.000
Surgical ward	95.67 ± 0.480	98.04 ± 1.315	17.678	0.000
Intensive care ward	94.41 ± 0.888	98.51 ± 1.047	13.247	0.000

Table 4. The drug dispensing satisfaction in patients before and after the PDCA cycle

several peak hours, standardize written medical orders, issue bare drug tracking forms to track the distribution of naked drugs in clinical departments, regularly check the status of bare drug adjustments in clinical departments, and strengthen the safety regulation of drug care in various departments. The naked drug is distributed to the patient to reduce the occurrence of drug-related adverse events,³ to standardize safe medication and improve patient medication safety.^{4,5}

4.2. Strengthen the naked medicine management, improve the patient satisfaction degree

The results show that in the periodical application of PDCA circulation method in naked medicine management, the naked drugs quantity and the number of adverse drug events were significantly lower. The patient's satisfaction degree on medication guide has improved significantly. The patient satisfaction is a hot spot study at home and abroad, it is also the core content of high-quality nursing service.⁶ This study adopts the PDCA circulation method, from the perspective of clinical ward naked distribution and adverse drug events, to find and solve the problems.

Repeating the four activities plan, implementation, inspection, processing, improve the safety of the drug dispensing specification, strengthen the training-related nurses' drug knowledge. By improving the drug-dispensing knowledge in all kinds of way, to reduce the occurrence of adverse events, improve patient satisfaction degree.

4.3. Thinking in the process of PDCA cycle

The analysis of the reasons, the objective data collected from various departments, find out the fundamental cause of the naked distribution, to improve the drug naked, reduce the adverse events, and improve patient safety as a fundamental purpose. The improvement measures are put forward in this study by the method of brainstorming. The nurses, pharmacists, and the information personnel were the focus on together.⁷ The patients or families were interviewed. The query information based on the experience of the peer, optimize the improvement measures, to reduce the ward naked medicine dispensing. The basis and improvement measures in the process of implementation of PDCA cycle were executive deviation case or optimized continuously. In addition, regular random sampling of bare drug distribution, comprehensive monitoring, supervision, assessment, and a correct and continuous PDCA process could improve the safety of clinical drug use.

5. Conclusions

PDCA cycle is a scientific method for quality management. This method of quality management has been widely used in various fields.³⁻⁶ This study through effective exploration, reduced the automatic medicine packing machine naked drug distribution, ensure the safety of clinical drug use, reduced the risk of staff in the clinical work, and at the same time, improve the level of pharmacy management mode. We establish a table of the clinical drug kinds and naked distribution tracking, a quality inspection team of naked medicine management. The quality team members take part in charge of pharmaceutical management of pharmacy department; another part is clinical nursing managers. The several aspects at the same time ensure the naked distribution and clinical drug use safety. PDCA cycle management is a continuous quality method of the management. For the application in the naked distribution management in the processing, we summarize the successful

experience, draw lessons from failure, and put forward the improvement scheme of next steps, and go to the next PDCA cycle naked medicine management solution.

In summary, the application of PDCA cycle in the management of bare drug can reduce the number and frequency of naked drug dispensing in the ward, reduce adverse drug events, improve patient satisfaction, and improve medical management knowledge and drug management policies for medical personnel.

Ethics approval

This study was approved by the Ethics Committee of the East Hospital Affiliated to Tongji University with No. 49[2019]. Written informed consent was obtained from all of the experts.

Conflicts of interest

All contributing authors declare no conflicts of interest.

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