

The Effect of PDCA Cycle Management Method on the Promotion of Nursing Quality Management in the Operating Room

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Abstract: The quality management of operating room nursing improves the overall level of nursing quality and thus plays a vital role in operation. Here investigations were conducted to detect whether PDCA cycle (Plan, Do, Check and Act) can improve the nursing quality management and the doctors' cooperation satisfaction level towards nurses of the operating room. PDCA cycle management method was implemented in the nursing quality management of the operating room. From June 2015 to June 2016, the influence of the PDCA cycle management method on nursing documents writing, theory knowledge level, skill operation level and surgeon satisfaction in the operating room was investigated by observation. Compared with the average level before implementation of PDCA cycle, the qualification rate of the surgery patient care records, patient transfer lists and tripartite checklists were significantly increased. The pass rate of the nursing theory and nursing skill operation examination of nurses was also increased compared with before. Furthermore, surgeon satisfaction was also increased compared with the average level before implementation of PDCA cycle and the differences had statistical significance ($P < 0.05$). Therefore, PDCA cycle management method implemented in the nursing quality management of the operating room effectively improve the quality of the nursing care, doctor-nurse relationship and therefore should be considered for popularization.

Keywords: PDCA Cycle Management, The Operating Room Nursing, Quality Management

1. Introduction

The quality management of operating room nursing plays a vital role in operation. Significant changes in the healthcare environment in China demand for a higher level of nursing quality management. Thus to improve the quality management level of operating room care and promote the surgical efficacy is the goal of all operating room management staff [1]. The PDCA cycle, also known as the Deming Cycle, was designed to coordinate continuous improvement plans by categorizing improvement actions into a dynamic cycle of four steps: plan, do, check, and act [1]. It's a method used to implement total quality management (TQM). In the 1990s, the PDCA cycle management method was used in the medical field and was gradually accepted [3]. In recent years, the PDCA cycle management method has been applied to the

quality management of nursing, which has effectively improved the quality of care [4, 5]. However, reports on the application of PDCA cycle management method to the quality management of operating room nursing are rarely seen. Here investigations were made to detect whether PDCA cycle (Plan, Do, Check and Act) can improve the nursing quality management and the doctors' cooperation satisfaction level towards nurses of the operating room.

2. Materials and Methods

2.1. Objective

Study approval was obtained from the Xijing Hospital Ethics Board. Between June 2015 and June 2016, 47 nurse staff of the operating room in our hospital who entered the

hospital before June 2015 were included in our study and trainees were excluded from recruitment. The study was completed anonymously. There were 12 operating rooms in

our hospital, and the ratio of surgical nurses to operating beds is 3.92:1. The personnel composition was shown in Table 1.

Table 1. Personnel composition of nurses included.

Gender	Title	Degree	Years of working
Male	4	Co-chief nurse	1
Female	43	Nurse-in-charge	8
		Senior nurse	21
		Nurse	14
		Junior nurse	3
47	47	47	47

2.2. Methods

PDCA cycle management method has been applied to the quality management of operating room nursing. Observation was conducted on the influence of the PDCA cycle management method on nursing documents writing, theory knowledge level, nursing skill operation level and surgeon satisfaction in the operating room.

2.2.1. PDCA in Nursing Documents Writing Management

i. Plan

Problems in nursing documents writing were as follows: missing messages in nursing forms; poor handwriting or misspellings; lack of signature or allograph. Based on our investigation and probable causes, plans were made to improve acknowledgement of medical regulations, conduct training on the nursing documents writing.

ii. Do

Nurses were organized to carry on regulation learning once every month. To achieve better quality management, quality control group composed of well-educated nurses was established to check documents writing quality and shift arrangement.

iii. Check

Based on the Basic specifications for medical record writing in China (2017), evaluation was conducted monthly on nursing documents writing. The total score was 100 and ≥ 95 was qualified.

iv. Action

Monthly learning of regulations and document writing was normalized.

Remaining problems: Shortage of nurses remains a realistic problem. It is difficult to completely solve the problem of relying on the nurses to strengthen the rational scheduling management, and enter the next PDCA cycle.

2.2.2. PDCA in Theory Knowledge Training Management

i. Plan

Problems were as follows: according to the theoretical knowledge assessment conducted by the Ministry of Nursing, low-age nurses lack basic and professional theoretical knowledge; high-age nurses' care concept is obsolete. Training schedules for different ages of nurses in accordance

with their knowledge were arranged and standardized training was implemented for new nurses. To offer more training opportunities for nurses, advanced study were also conducted.

ii. Do

Training courses according to the established plan were well organized and encouraged nurses to participate in various professional courses to strive for higher education. Clinical practice opportunities were offered for middle and low-grade nurses. Measured were taken to strengthen the standardization training.

iii. Check

Evaluation was made to investigate the effects of the intervention by organizing theoretical knowledge assessment regularly. The theoretical knowledge examination mainly includes: basic knowledge of safe medication, knowledge related to emergency plan, knowledge related to disinfection and isolation, knowledge about nosocomial infection, communication skills of nurses and relevant knowledge of laws and regulations. Out of 100 points, ≥ 95 is divided into excellent, ≥ 75 is qualified.

iv. Action

Theoretical knowledge training system for new nurses was standardized and different training content was set for nurses of different levels.

2.2.3. PDCA in Nursing Skill Operation Ability Management

i. Plan

Through the nursing skill operation assessment survey organized by the Ministry of Nursing, it's apparent that the nursing operation ability of the operating room nurse needs to be further improved. Measures were taken to increase training courses on unified training standards, providing more practical opportunities for nurses in the operating room.

ii. Do

A training venue was set so that nurses can practice at any time. Nurses with higher academic qualifications were chosen to give training courses to achieve proficiency in operation process. Seminars were held regularly to find better teaching methods. By watching standardized operation video, trainees were able to understand how to solve problems that arise during the operation.

iii. Check

To evaluate the effects of the intervention, 15 technical operations closely related to the operation of the operating room were selected for assessment. The score for each operation is 100 points, and ≥ 90 is qualified.

iv. Action

The measures that can be standardized are as follows: set up a training course, hold teaching method seminar and watch training videos.

2.2.4. PDCA in Surgeon Satisfaction

i. Plan

Questionnaire was designed and distributed to investigate the surgeon's satisfaction with the operating room nurses. The survey found that operating room nurses management needs to be further improved in the following aspects: poor communication skills and lack of surgical related knowledge; staff shortage and poor supervision; weak support from surgeons.

ii. Do

Surgical related knowledge learning and skills training by experienced surgeons were organized and nursing experts every two weeks to improve nurses' surgery preparation and coordination skills. Surgeons were invited to participate in our nurse daily symposiums to enhance mutual understanding, and gain their support. To motivate nurses, reward and punishment system was set up based on previous suggestions.

iii. Check

To evaluate the effects of the intervention, a self-made surgeon satisfaction questionnaire was designed to investigate

the surgeon's satisfaction with the operating room care staff and compare it with the previous survey results. Levels of satisfaction are as follows: highly satisfactory, partly satisfactory, not satisfactory and dissatisfactory.

iv. Action

By checking the survey results and obtaining feedbacks from nurses, investigators concluded measures that can be standardized and retained: regular physician-nurse relations symposiums and system of rewards and punishments.

2.2.5. Statistics

All data were processed and analyzed by SPSS 13.0 statistical software. The enumeration data were expressed as percentage and Chi-square test was used to analyze data before and after the intervention while the measurement data were expressed by the mean \pm standard deviation and compared using t-test. $P < 0.05$ was considered statistically significant.

3. Results

3.1. PDCA in Nursing Documents Writing

Respectively, 300 medical records of patients were randomly selected before and after the implementation of PCDA and the nursing records, patient delivery orders and tripartite checklists within were examined. The results showed that the qualification rates of nursing records, patient delivery orders and tripartite checklists after the implementation of PCDA were significantly higher than those before ($\chi^2=4.842, 4.394, 4.182$, all P values were significant). Data were shown in Table 2.

Table 2. Comparison of qualified rates of nursing document writing before and after PDCA implementation.

	medical record number	nursing records		patient delivery orders		tripartite checklists	
		Qualified amount	Qualified rate	Qualified amount	Qualified rate	Qualified amount	Qualified rate
Before	300	246	82.0%	257	85.7%	265	88.3%
After	300	294	98.0%	296	98.7%	298	99.3%
X ²	--	4.842		4.394		4.182	
P value	--	0.024		0.027		0.031	

3.2. PDCA in Theory Knowledge Assessment

After the implementation of PDCA, the qualified rate of nursing theoretical knowledge assessment was significantly higher than before. The difference was statistically significant

($P < 0.05$). The qualified rate of nursing theory knowledge of nurses at different levels was also significantly higher. Data were shown in Table 3.

Table 3. Comparison of qualified rates of nursing theoretical knowledge assessment before and after PDCA implementation.

	N0 nurse* (n=3)		N1 nurse (n=10)		N2 nurse (n=15)		N3 nurse (n=10)		N4 nurse (n=9)		All nurses (n=47)	
	Qualified amount	Qualified rate	Qualified amount	Qualified rate	Qualified amount	Qualified rate	Qualified amount	Qualified rate	Qualified amount	Qualified rate	Qualified amount	Qualified rate
before	1	33.3%	5	50.0%	8	53.3%	7	77.8%	7	70.0%	28	59.6%
after	3	100%	8	80.0%	12	80.0%	9	100%	9	90.0%	41	87.2%
X ²	5.297		4.272		4.164		4.098		3.992		4.998	
P value	0.011		0.028		0.030		0.032		0.037		0.019	

* N0 nurses, nurses who worked for less than 6 months. N1 nurses, nurses who worked for 1-3 years. N2 nurses, nurses who worked for 4-6 years. N3 nurses, nurses who worked for 7-12 years. N4 nurses, nurses who worked as nurse-in-charge for more than 5 years.

3.3. PDCA in Nursing Skill Operation Quality

The qualified rate of nursing skill operation, such as vital signs monitoring, microinjection pump use, non-synchronized

cardiac defibrillation, prevention and care of pressure sore after PDCA was significantly higher than before ($P < 0.05$), as shown in Table 4.

Table 4. Comparison of qualified rates of nursing skill operation assessment before and after PDCA implementation.

	amount	aseptic operation	vital signs monitoring	Indwelling catheter	oxygen inhalation	Peripheral venous transfusion	artery blood-collection
before	47	43(91.5%)	40(85.1%)	42(89.4%)	44(93.6%)	34(72.3%)	40(85.1%)
after	47	45(95.7%)	46(97.9%)	44(93.6%)	45(95.7%)	45(95.7%)	42(89.2%)
X2		2.732	4.272	2.388	1.263	6.393	1.973
P value		0.078	0.028	0.098	0.182	0.007	0.103

	CPR	ECG monitoring	microinjection pump use	non-synchronized cardiac defibrillation	prevention and care of pressure sore
before	36(76.6%)	45(95.7%)	40(85.1%)	39(83.0%)	41(87.2%)
after	46(97.9%)	46(97.9%)	45(95.7%)	44(93.6%)	45(95.7%)
X2	7.482	1.172	5.192	4.283	4.263
P value	0.005	0.189	0.018	0.026	0.029

3.4. PDCA in Surgeon Satisfaction

A total of 97 surgical surgeons were surveyed for satisfaction with the nursing work in the operating room. The satisfaction after PDCA implementation was significantly improved compared with before. The difference was statistically significant ($X^2=4.675$, $P < 0.05$), as shown in Table 5.

Table 5. Comparison of qualified rates of nursing skill operation assessment before and after PDCA implementation.

	number	Highly satisfactory	Partly satisfactory	Not satisfactory	Dissatisfactory	Satisfaction rate
before	97	24	43	22	8	67(69.1%)
after	97	39	52	5	1	91(93.8%)

4. Discussion

Nursing quality management in operating room has always been a vital part in operating room management. PDCA cycle tools were implanted into the nursing quality management in operating room, instead of traditional paper methods, to stimulate whether the method could improve working efficiency in operating room nursing work.

Improving the quality of nursing documents writing is an important part of nursing quality management in operating room [6]. Surgical patient care record sheet, patient handover sheet and tripartite checklist are indispensable parts of the medical record. When medical disputes occur, medical and nursing documents are the main evidence for medical institutions. Therefore, nursing documents are of legal significance [6]. In our study, PDCA cycle management method was introduced into the writing of nursing documents in the operating room. During the implementation of PDCA cycle, problems were found, solved, and experiences were summarized. In the implementation process, PDCA were applied in different stages. Finally, good methods and habits were fixed, standards formed and implemented. Also, this study found that the writing ability of staff is also an important factor affecting the quality of nursing documents. Therefore, nurses were trained in operating room to write improve the quality of nursing documents writing, which also improves their humanistic literacy.

To master the basic nursing knowledge is the prerequisite of competent nurses, and to understand the relevant knowledge of nursing is necessary for improving the quality of nursing [7, 8]. In order to adapt to the development of medicine, nurses should improve their theoretical knowledge [9]. The study found that the theoretical knowledge of operating room nurses was poor, and it was a close related with the intellectual levels of nurses. Firstly, the N0 level nurses who just graduated were trained so that they can adapt to their jobs as soon as possible. At the same time, different levels of nurses should be trained with correspondence to make effective use of training resources and improve training efficiency.

Nursing skill operation is an important index to measure the quality of clinical nursing service. Standardized nursing skill operation is the key to ensuring medical safety and reducing medical accidents [10]. During the implementation of PDCA cycle, it was found that the teaching level of the instructor was an important factor in affecting the nursing skills in operating room. Therefore, investigators set up a selection mechanism for teaching teachers to select teachers with higher teaching ability, and conduct regular seminars on teaching methods. In the process of teaching, watching videos first, then explaining and practicing is adopted to enhance nurses' ability of observation, thinking and solving problems. Different nurses have different needs for teaching [10]. To solve the problem, individual PDCA cycle management was developed, which helps solve the problem and attain better results.

Good relationship between surgeons and nurses guarantees a successful operation [12]. Surgeons' satisfaction with nursing work of nurses in operating room can affect the psychological mood of surgeons, thus affecting their work efficiency and quality [13]. Therefore, for the operating room, not only the knowledge of nurses matters, but also their knowledge of sociology, psychology, humanities and communicational skills [13]. With the busy work of hospitals, there is a lack of communication between doctors and nurses, which often leads to misunderstandings and affects surgery effectiveness [15]. In the implementation of PDCA cycle management, regular medical symposiums were held to enhance the understanding between doctors and nurses, so as to gain the understanding, trust and support of surgeons, and achieve mutual respect. In this way, better cooperation between doctors and nurses was achieved. In addition, management was strengthened and reward and punishment system was implemented, which not only standardized the behavior of nurses in operating room, but also improved their sense of responsibility, and in turn won the respect of surgeons.

In the process of implementing PDCA cycle management method, experiences were also gained: (1) PDCA cycle management method cannot solve all problems at once. Administrators should distinguish primary and secondary problems, solve the main problems first. Secondary problems can be left to solve in the next cycle. (2) After discovering the problems, it's better to find out the reasons as far as possible. The more comprehensive the reasons are, the more detailed the countermeasures may be and the better the intervention effects are. (3) Implement cycle should be conducted according to the sequence of planning, implementation, inspection and treatment, never skip any steps; (4) Every PDCA cycle should be summarized, and the planning objectives for the next cycle should be formulated, and the quality level will be further improved when the cycle is repeated. These results showed that after the implementation of PDCA cycle management method in nursing quality management of operating room, the nurses in operating room improved significantly in writing quality of nursing documents, mastery of nursing theory knowledge, operation level of nursing skills and satisfaction degree of surgeons also increased, which proved that PDCA cycle management method could improve the nursing quality of operating room and promote nursing care in an all-round way. Management quality forms a continuous improvement cycle process, which is worth spreading.

5. Conclusion

Improving the overall level of nursing quality is one of the primary goals of operating room quality control. In the various aspects of quality control investigated, significant improvements were achieved through PCDA cycle. Qualification rate of the surgery patient care records, patient transfer lists and tripartite checklists were significantly increased. The pass rate of the nursing theory and nursing skill

operation examination of nurses was also increased compared with before. Furthermore, surgeon satisfaction was also significantly increased compared with the average level before. In conclusion, PDCA cycle management method implemented in the nursing quality management of the operating room effectively improve the quality of the nursing care, doctor-nurse relationship. The PDCA cycle should be considered for popularization by administrators and head nurses.

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