Analysis on Applied Effect of Intelligent Medicine Integration System Construction Combined with Problem-based Learning Approach in Operation Room Nursing Management and Training

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To explore the applied effect of intelligent medicine integration system construction combined with problem-based learning (PBL) approach in operating room nursing management and training. 120 nursing staff working in our hospital from January 2019 to January 2020 were selected as the research object and randomly divided into group A (n=60) and group B (n=60), with the routine PBL approach and the PBL approach combined with intelligent medicine integration system performed to group B and group A respectively to compare the assessment results of operating room nursing management, scores on evaluation of the teaching methods, incidence rates of adverse nursing events, nursing management quality and patient satisfaction. Compared with group B, the trained nursing staff in group A had significantly better performance in operating room nursing management (P<0.001), higher score on evaluation of the teaching method (P<0.001), lower incidence rate of adverse nursing events in operating room (P<0.05), higher nursing management quality (P<0.001), and higher patient satisfaction (P<0.05). The intelligent medicine integration system construction combined with the PBL approach can effectively improve the comprehensive quality of nursing staff, optimize the quality of operating room nursing management, and lower the incidence of adverse nursing events, which should be promoted in clinical practice.

Keywords: intelligent medicine; learning approach; operating room nursing management

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The operating room is an important place to treat patients with many risk factors that can endanger patients' life in case of omissions, so it is essential to optimize the level of nursing in the operating room. Enhancing nursing management is the key to improving the nursing quality, and while the operating room nursing staff have higher work intensity and difficulty, it is hard to improve the level of nursing management solely by the own strength of the head nurse. Therefore, professional skills training must be given to the operating room nursing staff to enhance their awareness of nursing management and fully optimize the effect of nursing management in the operating room[1-3]. The problem-based learning (PBL) approach is the most commonly used training method for nursing staff in the clinic, which aims to combine real cases with training

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courses to enhance the practical application of the professional knowledge of nursing staff. Studies have shown that PBL can help nursing staff to develop critical thinking, enhance their perception of background and comprehensive learning effects. Recently, with all levels of hospitals gradually establishing a network management system of intelligent medicine, network-based PBL (WPBL) that can strengthen the training management level, optimize the training quality and improve the comprehensive quality of operating room nursing staff has been initially applied in practice[4-7]. Based on this, to explore the applied effect of intelligent medicine integration system construction combined with PBL approach in operating room nursing management and training, 120 nursing staff working in our hospital from January 2019 to January 2020 were selected as the research object, and the results are summarized as follows.

MATERIALS AND METHODS

General Information

120 nursing staff working in our hospital from January 2019 to January 2020 were selected as the research object and randomly divided into group A (n=60) and group B (n=60), with no statistical difference in the general information between the two groups (P>0.05), see **Table 1**. The study was approved by the Hospital Ethics Committee.

Table 1 Comparison of nursing staff's general information

Group	N	Age (years old)		Grades at school (points)		Educational degree		
		Range	Mean age	Theory	Skills	College	Bachelor	Master
Group A	60	45-74	26.12±3.22	86.21±5.23	79.56±3.56	25	34	1
Group B	60	45-75	26.23±3.13	86.22±5.24	80.11±3.25	26	33	1
t			0.190	0.010	0.884	0.034	0.034	0.000
P			0.850	0.992	0.379	0.853	0.854	1.000

Inclusion Criteria

The inclusion criteria for nursing staff of the study were as follows. ① On service nursing staff with nurse license of our hospital; and ② no prior reception of relevant training.

Exclusion Criteria

The exclusion criteria for nursing staff of the study were as follows. ① Failure to fully participate in the training; and ② failure to join the assessment and evaluation.

Methods

The routine PBL approach was performed to group B. Teachers prepared multimedia courseware and explained the knowledge of operating room nursing management by adopting the problem introduction method, and instructed the nursing staff to conduct after-class review.

The PBL approach combined with the intelligent medicine integration system was performed to group A with the following specific steps. ① The basic training of intelligent medicine integration system construction combined with the PBL approach was given to the nursing staff, so that they could fully understand the main points of the approach and improve the ability to use the network management system of intelligent medicine, providing a good foundation for the subsequent training. ② One member in the group was assigned as the organizer to guide the nursing staff to ask questions, another member was selected as the recorder to record and summarize the questions for review; the operation course was still carried out in the form of cooperation, in which the organizer led the discussion, nursing staff conducted the operation and presentation, and the recorder was responsible for recording the operation process for subsequent review and learning. ③ The technical support of intelligent medicine network management system was provided by the audio-visual education department, and in addition to the patient use module, the platform also contained a management module for internal personnel, so that nursing staff can use the functional areas including communication, discussion and assessment for training; according to the materials such as management standards for operating room nursing, technical standards for operating room nursing and surgical cooperation operating protocol, teachers should design the scenario problems based on the clinical practice experience and teaching goal of operating room nursing management, ensure the authenticity of cases, upload the involved materials and courseware to the teaching platform, and help the nursing staff to download them for preview. ④ The nursing staff could consult data online and conceive a solution to the scenario problem according to the materials from the link given by teachers, during which teachers should give proper guidance to ensure the nursing staff can propose realistic solution with a critical perspective. ⑤ Nursing staff could submit their learning outcomes to the teaching platform for summary and discussion

during class, and teachers explained the key problems experienced by nursing staff in operating room nursing management to improve the professional skills of nursing staff. ⑥ On this basis, teachers should also inform the nursing staff about nursing documents writing with the help of intelligent medicine network management system and help the nursing staff in searching and transferring patients' case reports, files and medicinal images and videos online to realize a paperless and networked operating room nursing management. ⑦ Teachers should systematically manage the attendance, training, rewards and punishments of nursing staff with the aid of the system application for monitoring, and finally the theoretical performance assessment was also conducted on the system platform.

Observation Criteria

① Result of operating room nursing management assessment, which included theory assessment and operation assessment. The theory assessment result contained phased test results, medical care feedback, ability to make network courseware, and the mastery of the intelligent medicine integration system; and the operation assessment result was rated based on the Operating Room Nursing Technical Specifications and Scoring Standards with the items including aseptic technique, intravenous treatment, position placement, instrument operation, and operating room management. The maximum score of both assessments was 100 points, with higher scores indicating better performance[8-11].

② Scores on evaluation of the teaching approach. The evaluation of the two teaching approaches by nursing staff was rated by the self-proposed scale of our hospital, and the items rated included the promotion strength of both approaches to the professional skills and comprehensive ability of the nursing staff. The maximum score was 100 points, with higher scores indicating better teaching effect[12-15].

③ Incidence rate of adverse nursing events. The adverse events occurred during operating room nursing management, mainly included the mistakes in instrument management and basic nursing operation, were compared between the two groups, and the total incidence rate was calculated.

④ Nursing management quality. A quality control team of operating room nursing management was established to evaluate the management quality of both groups before and after training. The maximum score was 100 points, with higher scores indicating better nursing management quality.

⑤ Patient satisfaction. On a scale of 0-5 stars, patient satisfaction with the nursing staff in the two groups were investigated by the self-proposed questionnaire of our hospital, with 5 stars indicating fully satisfied, 3-4 stars indicating satisfied, and 2 stars and less indicating unsatisfied.

Statistical Processing

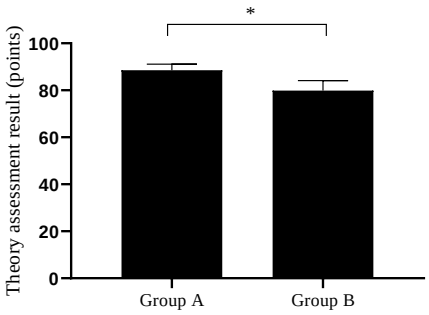
In this study, the data processing software was SPSS20.0, the picture drawing software was GraphPad Prism 7 (GraphPad Software, San Diego, USA), items included were enumeration data and measurement data, methods used were X2 test and t-test, and differences were considered statistically significant at $P<0.05$.

RESULTS

Comparison of Results of Operating Room Nursing Management Assessment

The result of operating room nursing management assessment of group A was significantly higher than that of group B ($P<0.001$), see **figures 1-2.**

Figure 1 Comparison of nursing staff's theory assessment results ($\bar{x}\pm s$, points)

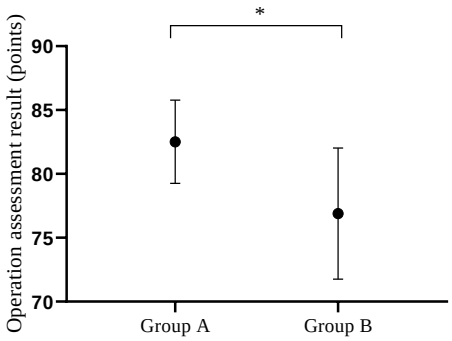


Note: In Figure 1, the horizontal axis from left to right indicated group A and group B, and the vertical axis indicated the theory assessment result (points).

The theory assessment result of group A and group B was (88.56±2.54) and (79.89±4.20), respectively.

* indicated $P<0.001$.

Figure 2 Comparison of nursing staff's operation assessment results ($\bar{x}$±s, points)



Note: In Figure 2, the horizontal axis from left to right indicated group A and group B, and the vertical axis indicated the operation assessment result (points).
The operation assessment result of group A and group B was (82.51±3.26) and (76.89±5.14), respectively.
* indicated P<0.001.

Comparison of Scores on Evaluation of Teaching Approach by Nursing Staff

Compared with group B, nursing staff in group A gave significantly higher score on the evaluation of the teaching approach (P<0.001), see **Table 2**.

Table 2 Comparison of scores on evaluation of teaching approach by nursing staff ($\bar{x}$±s, points)

Item	Group A	Group B	t	P
Increasing basic theory knowledge	89.89±3.59	78.51±2.12	21.143	0.000
Stimulating study interest	85.11±2.56	74.10±2.58	23.465	0.000
Enhancing communication skill	87.14±3.51	78.12±2.30	16.650	0.000
Promoting evidence-based nursing ability	92.11±2.45	83.25±3.25	16.862	0.000
Enhancing problem solving ability	93.55±2.45	85.25±4.12	13.412	0.000
Promoting software using ability	92.58±3.12	79.51±3.50	21.592	0.000
Promoting logical thinking ability	91.20±3.21	84.58±3.69	10.485	0.000

Comparison of Incidence Rates of Adverse Nursing Events in Operating Room

The incidence rate of adverse nursing events in operating room of group A was significantly lower than that of group B (P<0.05), see **Table 3**.

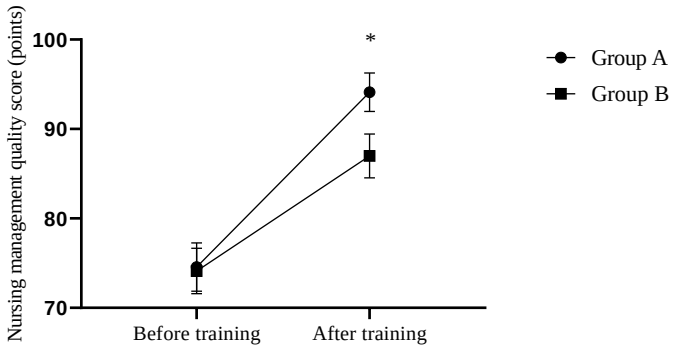
Table 3 Comparison of incidence rates of adverse nursing events in operating room [n(%)]

Item	Group A	Group B	X^2	P
Drug leakage or late drug change	1 (1.7)	4 (6.7)	1.878	0.171
Insufficient preparation of surgical materials	0 (0.0)	3 (5.0)	3.077	0.079
Non-standard nursing document writing	1 (1.7)	3 (5.0)	1.035	0.309
Disinfection dissatisfaction	0 (0.0)	2 (3.3)	2.034	0.154
Incomplete first-aid case articles	1 (1.7)	3 (5.0)	1.035	0.309
Inadequate anesthesia management	0 (0.0)	2 (3.3)	2.034	0.154
Total incidence rates	3 (5.0)	17 (28.3)	11.760	0.001

Comparison of Nursing Staff's Nursing Management Quality

After training, the nursing management quality of group A was significantly higher than that of group B (P<0.001), see **Figure 3**.

Figure 3 Comparison of nursing staff's nursing management quality ($\bar{x}$±s, points)



Note: In Figure 3, the horizontal axis from left to right indicated before and after training, and the vertical axis indicated the nursing management quality score (points); the line with dots indicated group A, and the line with blocks indicated group B.

Before training, the nursing management quality score of group A and group B was (74.56±2.69) and (74.12±2.54), respectively.

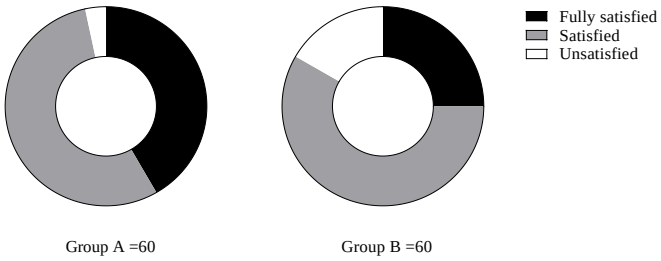
After training, the nursing management quality score of group A and group B was (94.11±2.15) and (86.98±2.45), respectively.

* indicated P<0.001.

Comparison of Patient Satisfaction

Compared with group B, the patient satisfaction with nursing staff in group A was significantly higher (P<0.05), see **Figure 4**.

Figure 4 Comparison with patient satisfaction with nursing



Note: In Figure 4, the black area indicated fully satisfied, the light gray area indicated satisfied, the white area indicated unsatisfied; the left image indicated group A, and the right image indicated group B.

The number of patients fully satisfied with nursing of group A and group B was 25 and 15, respectively;

The number of patients satisfied with nursing of group A and group B was 33 and 35, respectively; and

The number of patients unsatisfied with nursing of group A and group B was 2 and 10, respectively.

DISCUSSION

With the continuous development of "Internet Plus" technology in recent years, all levels of hospitals have successively established online medical management platforms (usually referred to as the intelligent medicine integration system in academia) that can combine a series of data including the internal management, patient files, laboratory information of hospitals and transmit and send them through the network, so as to optimize the hospital management efficiency and realize the construction of smart hospitals[16-19]. In this study, nursing staff in group A who were trained in the form of intelligent medicine integration system combined with PBL obtained significantly higher results of operating room nursing management assessment than those in group B (P<0.001), showing that WPBL could effectively promote the theoretical knowledge level of nursing staff. This was because teachers could send the courseware to the network platform in advance, so that nursing staff could preview before class and consult and

learn the information from the link given by teachers. In addition, as nursing staff in the operating room had more intensive working hours, WPBL could promote the time use efficiency, help them to go through online learning anytime anywhere, and enhance the ability of application in real cases, so the performance of this group was more desirable[20-23].

Compared with the traditional multimedia teaching approach, WPBL could provide a large amount of training materials for nursing staff with significant advantages such as intuitiveness and up-to-dateness, and the nursing staff could solve their doubts through online searching, obtain the latest learning materials, constantly discover and solve problems, and train their critical thinking[24], so the score on evaluation of teaching approach given by the nursing staff in group A was significantly higher than that in group B ($P<0.001$). In the study conducted by Kowalski C, WPBL teaching and PBL teaching were performed to nursing staff in the experimental group and the control group respectively, and it was found that nursing staff in the experimental group had higher evaluation on the teaching mode and gave (93.56 $\pm$ 2.54) points to the item "promoting evidence-based nursing ability", which was significantly higher than that of the control group ($P<0.001$)[25], indicating that WPBL worked well in enhancing the comprehensive quality of nursing staff.

Operating rooms are more demanding for nursing management, and practical operation and training of nursing staff is extremely important. Nursing staff only learn knowledge mechanically from the conventional PBL teaching method and cannot understand the essence of the nursing work in the operating room, so there are certain limitations. With the help of WPBL, nursing staff could closely combined the scenario and knowledge, review the operation videos and communication records at any time, summarize and rethink the gaps in nursing management, and constantly improve their own nursing management ability, so group A had significantly lower incidence rate of adverse nursing events in operating room ($P<0.05$) and higher nursing management quality ($P<0.001$) when comparing with group B[26].

Nursing disputes are more frequent in patients undertaking surgical treatment as there are many risk factors in the operating room that may endanger life. Comprehensive and meticulous nursing management in the operating room can fully protect patient rights and reduce the odds of nurse-patient disputes. In this study, the nursing staff in group A had better comprehensive performance and lower incidence rate of adverse events, so the patient satisfaction with nursing of group A was significantly higher than that of group B ($P<0.05$).

In conclusion, the intelligent medicine integration system construction combined with PBL teaching method can effectively improve the comprehensive quality of nursing staff, optimize the operating room nursing management quality, and lower the incidence rate of adverse nursing events, which should be promoted in clinical practice.

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