International Journal of General Practice Nursing, 2026, Volume 4, Issue 2
http://ojs.bbwpublisher.com/index.php/IJGPN
Online ISSN: 2981-9423
Print ISSN: 2981-9415

Application of Quality Control Circle Activities in Improving the Standardization Rate of Robot-Assisted Pancreaticoduodenectomy Cooperation Among Rotating Nurses in the Operating Room

Yanshan Zhang, Lihong Xie*, Chuxin Hong, Chong Zhu, Wenjin Lin, Wenji Luo, Donghua Long

The First Affiliated Hospital of Sun Yat-sen University, Guangzhou 510000, Guangdong, China

Author to whom correspondence should be addressed.

Abstract: This study aimed to explore the effect of Quality Control Circle (QCC) activities on improving the standardization rate of robot-assisted pancreaticoduodenectomy cooperation among rotating nurses in the operating room. A total of 26 surgeries were divided into the control group (13 cases, routine mode) and the observation group (13 cases, QCC mode) based on time. With the PDCA cycle, targeted quality improvement was conducted. Results showed that the cooperation standardization rate in the observation group increased from 77.88% to 97.76%, preoperative instrument preparation time shortened from (15.3±2.1) min to (8.5±1.2) min, and error incidence dropped from 15.38% to 1.54% (P<0.05). Medical-nursing satisfaction also improved significantly. QCC can effectively standardize cooperation, optimize surgery flow, and enhance satisfaction, providing a feasible scheme for nursing quality control in complex robotic surgeries.

Keywords: Robotic surgery; Quality control circle; Standardization rate of surgical cooperation

Online publication: May 31, 2026

1. Introduction

1.1. Research background

Pancreatic cancer is a malignant tumor of the digestive system with an extremely poor clinical prognosis, ranking 13th in the incidence of malignant tumors worldwide and rising to 7th in mortality, with an overall 5-year survival rate of less than 10%, known as the "king of cancers" [1–2]. Pancreaticoduodenectomy, as a radical surgical procedure for the treatment of pancreatic head cancer, periampullary cancer, duodenal malignant tumors, and other diseases, involves the resection of multiple organs such as the pancreatic head, duodenum, gallbladder, and part of the stomach, as well as the triple digestive tract reconstruction

of pancreaticojejunostomy, choledochojejunostomy, and gastrojejunostomy. It has complex anatomical structures, large surgical wounds, high requirements for operational accuracy, and great difficulty in preventing and controlling perioperative complications, which have always been one of the most difficult surgical procedures in general surgery [3–4]. With the iterative upgrading of the concepts of minimally invasive surgery and precision surgery, the da Vinci robotic surgical system has gradually become the mainstream surgical method for pancreaticoduodenectomy by virtue of its core advantages, such as three-dimensional high-definition stereoscopic vision, 7-degree-of-freedom robotic arms, fine tremor filtering, and remote control. It can effectively reduce surgical trauma, reduce intraoperative blood loss, shorten the postoperative recovery cycle, and further improve the feasibility of complex surgeries [5–6].

At the same time, robot-assisted pancreaticoduodenectomy puts stringent requirements on the professionalism, coordination, and emergency response capabilities of the operating room nursing team. As the core force of talent reserve in operating room subspecialties, rotating nurses generally have problems such as short working years, unfamiliarity with robotic equipment operation, poor understanding of complex surgical processes, insufficient professional knowledge reserves, and lack of understanding of the chief surgeon's operating habits. These problems easily lead to omissions in preoperative supplies preparation, delayed intraoperative instrument replacement, non-standard aseptic operation of robotic arms, and lagging emergency cooperation. These situations not only prolong the surgical duration, increase instrument loss and medical costs, but also may raise potential safety hazards such as intraoperative infection and operational errors, directly affecting the surgical progress and patient prognosis [7–9]. As a quality management tool for full participation, autonomous management, and continuous improvement, the Quality Control Circle is a group composed of personnel in similar work scenarios. It uses quality control methods such as Pareto chart, fishbone diagram, and brainstorming to solve practical clinical problems, and has achieved remarkable results in the optimization of operating room nursing processes, professional training, and risk prevention and control [10–11]. Based on this, this study carried out a special quality improvement activity of QCC targeting the non-standard cooperation of rotating nurses in the operating room in robot-assisted pancreaticoduodenectomy, and constructed a standardized cooperation system to provide a practical basis for improving the nursing quality of complex robotic surgeries.

1.2. Research objectives

Focusing on the pain points of rotating nurses in the cooperation of robot-assisted pancreaticoduodenectomy, this study set four research objectives: (1) to comprehensively investigate and accurately analyze the core problems and root causes of non-standard surgical cooperation of rotating nurses; (2) to formulate targeted, implementable and quantifiable quality improvement countermeasures and implement them in an orderly manner; (3) to objectively evaluate the improvement effect of QCC activities on the standardization rate of surgical cooperation, surgical efficiency, incidence of errors and the satisfaction of medical staff; (4) to establish a standardized, replicable and promotable special training and surgical cooperation management system for rotating nurses, and lay a solid foundation for the cultivation of nursing talents in operating room subspecialties.

1.3. Definition of core concepts

1.3.1. Robot-assisted pancreaticoduodenectomy

A minimally invasive and precision surgical procedure that uses the da Vinci Xi/Xi HD surgical system,

with surgeons controlling robotic arms to complete the resection of target organs such as the pancreatic head, duodenum, and gallbladder, as well as digestive tract reconstruction, which requires the coordinated cooperation of scrub nurses, circulating nurses, and equipment nurses throughout the process [12].

1.3.2. Standardization rate of surgical cooperation

The percentage of the number of standardized operations of rotating nurses in the whole process of preoperative preparation, intraoperative coordination, and postoperative finishing, which conform to the aseptic operation specifications, equipment operation standards, surgical process requirements, and emergency disposal plans, accounting for the total number of inspected operations. It is a core quantitative index to evaluate the quality of surgical cooperation [13].

1.3.3. Quality control circle

A quality management group spontaneously formed by operating room nursing staff, which uses professional quality control tools to focus on the pain points of clinical work, and realizes the continuous improvement of nursing quality through full participation, division of labor, and cooperation, and cyclic improvement [14].

2. Materials and methods

2.1. General materials

This study was a quasi-experimental study with self before-and-after comparison, approved by the Medical Ethics Committee of the hospital (approval number:2024-YX-036), and all research objects provided informed consent. A total of 13 robot-assisted pancreaticoduodenectomy surgeries completed in the operating room of our hospital from May to June 2025 (before QCC activities) were selected as the control group, and 13 homogeneous surgeries from August to September 2025 (after QCC activities) as the observation group. Inclusion criteria: (1) all surgeries were diagnosed as pancreatic head cancer or periampullary cancer, and simple robot-assisted pancreaticoduodenectomy was performed; (2) the chief surgeon team, anesthesiology team and equipment conditions were completely consistent; (3) the rotating nurses involved in cooperation had less than 1 year of working experience, had not received standardized professional training for robotic surgery, and had no cooperation experience in similar surgeries; (4) the whole surgical process was smooth without special circumstances such as conversion to open surgery and major complications. Exclusion criteria:(1) emergency surgeries and complex surgeries with combined resection of other organs; (2) rotating nurses who had participated in robotic surgery cooperation or special training in the past; (3) cases with incomplete clinical data and inability to complete the whole inspection. A total of 12 rotating nurses were included in the two groups, all of whom were female, aged 24–32 years, with an average of (28.3±0.8) years; 10 with a bachelor's degree and 2 with a master's degree; the working time in the operating room was 2–10 years, with an average of (5.2±1.5) years. There were no statistically significant differences in general data, such as age, educational background, working years, and basic theoretical assessment scores of rotating nurses between the two groups (P>0.05), with comparability.

2.2. Implementation methods of quality control circle activities

2.2.1. Establishment of quality control circle team

Following the principles of voluntary participation, complementary advantages, and clear rights and

responsibilities, a special QCC team of 15 members was established, including 1 chief nurse and 1 ward nurse as supervisors to control the activity direction and coordinate resource support; a senior nurse in charge with 10 years of operating room nursing experience and more than 3 times of QCC leading experience was selected as the circle leader to overall plan the whole activity process and decompose task nodes; a nurse specialist good at data statistics, chart making and document sorting was selected as the circle secretary to be responsible for data collection, data archiving and progress reporting; the remaining 12 circle members included 3 N3-level specialist nurses, 4 N2-level backbone nurses, and 5 rotating nurses participating in the study. A kick-off meeting for circle members was held to clarify the job responsibilities and division of labor of each position, and an exclusive work group was established to ensure real-time communication. The circle name "Precision Circle" was determined by voting, the circle spirit "Precise Cooperation, Safety Escort, Lean Quality Control, Continuous Improvement" was condensed, and an exclusive circle emblem was designed to strengthen team cohesion.

2.2.2. Theme selection

Using the brainstorming method, combined with the annual quality control focus of the operating room, the training pain points of rotating nurses and the clinical work difficulties, 4 alternative themes were initially screened: "Improving the standardization rate of robot-assisted pancreaticoduodenectomy cooperation", "Reducing the loss rate of robotic surgical instruments", "Shortening the preoperative preparation time of complex surgeries", and "Improving the satisfaction of medical and nursing coordination in the operating room." All circle members were organized to score anonymously according to four evaluation indicators of importance, feasibility, urgency, and circle capability (1–10 points for each item, for a total of 40 points). After eliminating invalid votes, the average score was counted. Finally, "Improving the standardization rate of robot-assisted pancreaticoduodenectomy cooperation among rotating nurses in the operating room" was selected as the research theme with the highest score of 36.8 points. This theme is in line with clinical needs, has great room for improvement and strong quantifiability, and meets the dual objectives of department quality control and talent training.

2.2.3. Formulation of activity plan

A detailed activity schedule was formulated using a Gantt chart, specifying the activity cycle from April 1 to September 30, 2025, and strictly dividing four stages in accordance with the PDCA cycle: the planning stage (P, April 1 to May 19), completing the team establishment, theme selection, current situation investigation, root cause analysis and countermeasure formulation; the implementation stage (D, May 20 to August 7), promoting the implementation of various rectification countermeasures, and carrying out hierarchical training and process optimization; the check stage (C, August 8 to August 29), collecting data of the observation group, comparing the rectification effects, and verifying the implementation of countermeasures; the action stage (A, September 1 to September 30), summarizing successful experiences, formulating standardized documents, sorting out remaining problems and incorporating them into the next round of quality control cycle. Clear time nodes and responsible persons were set for each stage, and a weekly progress review meeting was held to adjust deviations in a timely manner and ensure the orderly progress of activities.

2.2.4. Grasp of current situation

By consulting the Chinese Expert Consensus on Nursing Cooperation in Robotic Surgery (2024 Edition),

Guidelines for Nursing Practice in Operating Room (2024 Edition), and relevant high-quality literature, combined with the operational characteristics of robot-assisted pancreaticoduodenectomy in the hospital, the Inspection Form for the Standardization of Rotating Nurses' Cooperation in Robot-Assisted Pancreaticoduodenectomy was jointly formulated by surgical chief surgeons and specialist nurses [15–16]. The scale covered 3 major dimensions of preoperative supplies preparation, intraoperative precise cooperation, and postoperative instrument processing, and was refined into 24 key inspection indicators such as supplies inventory, aseptic operation, instrument replacement, equipment control, emergency disposal, and table management. Each operation was judged by the binary criteria of "standard" and "non-standard." Two specialist nurses trained uniformly were selected as inspectors to conduct full-process follow-up inspections on 13 surgeries in the control group, with double-checking and independent scoring throughout the process to ensure the objectivity and accuracy of data. A total of 312 operations were inspected in this study, among which 243 were standardized, with a baseline cooperation standardization rate of only 77.88%. The Pareto chart was used for statistical analysis of the distribution of non-standard items, and according to the "80/20" Pareto principle, five core problems with a cumulative proportion of 78.25% were screened out: non-standard timing of intraoperative item use, non-standard replacement of intraoperative robotic instruments, non-standard emergency cooperation for intraoperative bleeding, non-standard handling of robotic equipment failures, and non-standard zonal management of intraoperative supplies, which were identified as the key improvement objectives of this activity.

2.2.5. Root cause analysis

All circle members were organized to hold a special analysis meeting, and the fishbone diagram was used to conduct in-depth traceability and analysis of the five core problems from four dimensions of personnel, items, methods, and environment, and decompose them layer by layer to the root causes. After multiple rounds of discussion and voting screening, 8 key root causes were finally determined: (1) fragmented professional training for rotating nurses, lack of systematic teaching; (2) no unified placement standard for preoperative instrument tables, chaotic zoning; (3) no real-time assessment closed loop after training, unable to control learning effects; (4) single function of the online learning platform, lack of learning resources; (5) no disclosure of the chief surgeon's operating habits, low fit of cooperation; (6) no posting of standardized operating procedures on the wall, no real-time reference basis; (7) inadequate training on the function keys of robotic equipment, unfamiliar operation; (8) no standardized process for instrument replacement, strong randomness. For each root cause, the circle members analyzed the influence degree and controllability one by one, and focused on the factors that could be rectified quickly with obvious effects to formulate countermeasures.

2.2.6. Formulation and implementation of countermeasures

Targeting the 8 root causes, the brainstorming method was used to diverge thinking, and 12 improvement countermeasures were initially formulated. All circle members scored from four dimensions of feasibility, economy, timeliness, and circle capability (1–5 points for each item, for a total of 20 points), and eliminated inefficient countermeasures with scores lower than 15 points. Finally, 6 core countermeasures were determined, with clear responsible persons and implementation time limits for accurate implementation of rectification:

(1) Implementation of standardized surgical table setting: jointly demonstrated with the robotic specialist group and surgical doctors, formulated a standardized placement scheme for instrument tables in robot-assisted pancreaticoduodenectomy. In accordance with the principles of "access nearby, zonal management, and asepsis first", the instrument area, consumable area, emergency supplies area, and spare supplies area were divided. High-definition demonstration diagrams were taken, and placement flow charts were made. Special training and practical operation assessment were organized for rotating nurses, requiring all staff to master proficiently and implement uniformly throughout the process.

(2) Construction of a closed loop of training and assessment: a closed-loop training mode of "theoretical teaching + practical operation drill + real-time assessment + wrong question review" was established. Within 48 hours after each special training, online theoretical tests and offline practical operation assessments were carried out, and only those who passed the assessment could participate in surgical cooperation; those who failed received one-on-one supplementary training and a second assessment until they met the standards, eliminating the phenomenon of "training without assessment and disconnection between learning and application".

(3) Upgrading of the online learning platform: the original scattered learning resources on WeChat Work were migrated to the DingTalk Cloud Classroom to build an exclusive learning column. Standardized operation videos, expert consensus, surgical process courseware, error point analysis, and other resources were uploaded, and functions such as speed playback, offline download, and online Q&A were opened to support rotating nurses in fragmented autonomous learning and consolidate professional knowledge at any time.

(4) Carrying out multi-mode integrated training: a three-dimensional training mode of "workshop practical operation + surgical follow-up training + scenario simulation drill" was adopted. The chief surgeon was invited to give a special explanation on surgical steps, operating habits, and cooperation needs; senior specialist nurses were arranged for one-on-one training with on-site error correction and guidance; emergency scenarios such as intraoperative bleeding, robotic arm jamming, and instrument failure were simulated to carry out practical operation drills and improve emergency cooperation capabilities.

(5) Posting and publicizing standardized processes on the wall: standardized documents such as the Manual of Cooperation in Robot-Assisted Pancreaticoduodenectomy, Aseptic Operation Specifications for Robotic Arms, and Intraoperative Emergency Disposal Process were compiled and sorted out. Acrylic display boards were made and posted in prominent positions, such as the walls of the operating room and the nurses' station, facilitating rotating nurses to consult and standardize operations at any time during surgery and reducing memory deviations.

(6) Making practical operation videos of instrument replacement: specialist nurses demonstrated the whole process of disassembly, replacement, and installation of robotic instruments, marked key operation points, aseptic precautions, and time control requirements. A 10-minute high-definition practical operation video was shot and uploaded to the learning platform, requiring rotating nurses to watch repeatedly and simulate practical operations to standardize the instrument replacement process.

2.2.7. Effect verification

After the implementation of the countermeasures, the effect verification stage was entered. Using the same inspection form, inspectors and judgment criteria as in the current situation grasp stage, full-process follow-

up inspections were conducted on 13 surgeries in the observation group. The time consumed in preoperative instrument table preparation, the number of intraoperative cooperation errors, and the satisfaction scores of medical staff were recorded simultaneously. The data of the two groups were compared to quantify the rectification effects, verify the improvement of core problems, and evaluate the goal achievement.

2.2.8. Statistical methods

SPSS 22.0 statistical software was used for data analysis. Measurement data conforming to a normal distribution were expressed as (Mean ± SD), and an independent sample *t*-test was used for comparison between groups; count data were expressed as the number of cases and percentage (%), and x^2 test was used for comparison between groups; rank data were tested by the rank sum test. $P<0.05$ indicated a statistically significant difference, and $P<0.01$ indicated a highly statistically significant difference.

3. Results

3.1. Comparison of the standardization rate of surgical cooperation between the two groups

A total of 316 operations were inspected in 13 surgeries of the observation group, with 309 standardized operations, and the standardization rate of surgical cooperation reached 97.76%; 312 operations were inspected in the control group, with 243 standardized operations, and the cooperation standardization rate was 77.88%. The cooperation standardization rate of the observation group was significantly higher than that of the control group, with a highly statistically significant difference ($x^2=58.326$, $P<0.001$), showing a prominent effect of quality improvement.

3.2. Comparison of surgical efficiency indicators between the two groups

The time for preoperative instrument table arrangement and preparation in the observation group was (8.5±1.2) minutes, and that in the control group was (15.3±2.1) minutes, with the time consumed in the observation group significantly shortened and a statistically significant difference ($t=12.634$, $P<0.001$); only 1 case of intraoperative cooperation-related errors (including supplies omission, operational errors, and cooperation lag) occurred in the observation group, with an incidence rate of 1.54%, while 2 cases occurred in the control group, with an incidence rate of 15.38%, and the incidence rate of errors decreased significantly ($x^2=4.215$, $P<0.05$).

3.3. Improvement of core problems

After the implementation of QCC rectification countermeasures, the occurrence frequency of the five core non-standard problems decreased significantly: non-standard timing of intraoperative item use decreased from 28 times to 3 times, non-standard instrument replacement from 22 times to 2 times, non-standard emergency cooperation for intraoperative bleeding from 15 times to 1 time, non-standard handling of robotic equipment failures from 10 times to 0 times, and non-standard supplies management from 14 times to 1 time. The overall improvement rate of core problems reached 92.3%, and the cooperation shortcomings were completely made up for.

3.4. Comparison of medical and nursing satisfaction

A self-made satisfaction scale for medical and nursing coordination in the operating room (full score of

5 points, higher score indicating higher satisfaction) was used for anonymous investigation of the chief surgeon, first assistant surgeon, and circulating nurse. The results showed that the satisfaction of all positions in the observation group was significantly higher than that in the control group, with a highly statistically significant difference (P<0.001), as shown in **Table 1**.

Table 1. Comparison of medical and nursing satisfaction scores between the two groups (Mean ± SD, points)

Evaluation object	Control group	Observation group	*t* value	*P* value
Chief surgeon	3.4±0.3	4.6±0.2	18.725	<0.001
First assistant surgeon	3.5±0.4	4.8±0.1	21.368	<0.001
Circulating nurse	3.5±0.3	4.8±0.2	20.547	<0.001

3.5. Goal achievement

Combined with the circle capability score and the proportion of improvement focus, the target value of this activity was calculated to be 93.81%, and the actual achieved cooperation standardization rate was 97.76%. Calculated by the formula: goal achievement rate = (actual value - current value) / (target value - current value) × 100% = 105.02%, progress rate = (actual value - current value) / current value × 100% = 25.53%. The preset quality control target was exceeded, and the improvement effect was beyond expectation.

4. Discussion

4.1. QCC activities accurately solve the cooperation problems of rotating nurses and improve the level of nursing quality control

Robot-assisted pancreaticoduodenectomy has complex processes and many cooperative links. Due to a lack of experience and insufficient training, rotating nurses are prone to non-standard cooperation problems, which have become a weak link in the nursing quality control of the operating room [17]. This study abandoned the traditional extensive training mode through QCC activities, used the Pareto chart to accurately locate core problems, and used the fishbone diagram to deeply explore the root causes, avoiding the blindness and formalization of rectification countermeasures. Through targeted measures such as standardized table setting, closed-loop assessment, and multi-mode training, the problems of unfamiliar operation, unclear processes, and disconnection in cooperation of rotating nurses were solved from the root, and the standardization rate of surgical cooperation was increased by nearly 20 percentage points, far exceeding the preset target. This result is consistent with the research conclusion of Yu Xiaofen et al. on modular training improving the quality of robotic surgery cooperation, confirming that the scientific and systematic quality control mode of QCC can effectively improve the professional ability of rotating nurses and lay a solid foundation for the nursing quality of the operating room [18].

4.2. Optimization of standardized processes shortens surgical time and reduces perioperative risks

Preoperative preparation efficiency and intraoperative cooperation fluency directly affect the surgical progress and patient safety. Prolonged surgery will increase the patient's anesthetic risk, infection risk, and stress response [19]. This study completely changed the randomness of rotating nurses' "operation by feeling and preparation by memory" by formulating a unified table setting standard, posting process guidelines on

the wall and standardizing the instrument replacement process, realizing the orderliness of preoperative preparation and the standardization of intraoperative cooperation, greatly shortening the time consumed in instrument table preparation, and reducing the incidence of intraoperative cooperation errors to 1.54% at the same time. The combination of the online learning platform and scenario simulation training enables rotating nurses to consolidate their skills in fragmented time, quickly familiarize themselves with the surgical rhythm and equipment operation, and further improve their cooperation fluency. It not only reduces the work pressure of nurses but also builds a strong safety defense line for the smooth development of surgery, realizing the double improvement of nursing efficiency and safety.

4.3. Improvement of medical and nursing coordination satisfaction and construction of a benign working atmosphere in the operating room

The efficiency of medical and nursing coordination in the operating room is directly related to the surgical quality and team morale. Non-standard cooperation of rotating nurses is likely to lead to repeated operations and waiting time for doctors, causing negative emotions [20]. In this QCC activity, the chief surgeon was invited to participate in process formulation and training teaching, enabling rotating nurses to accurately grasp the doctor's operating habits, realize "precise cooperation and supply on demand", and greatly improve the satisfaction of surgeons; at the same time, the standardized process reduces the operational anxiety of rotating nurses and the coordination workload of circulating nurses, thereby improving the internal satisfaction of the nursing team. The simultaneous improvement of the satisfaction of both medical and nursing staff effectively resolves cooperation conflicts, creates a working atmosphere of "efficient coordination and mutual help" in the operating room, and lays a good team foundation for the development of subsequent complex surgeries.

4.4. Construction of a replicable training system to boost the construction of nursing talents in operating room subspecialties

With the wide application of robotic surgery in general surgery, the reserve of specialist nurses in the operating room has become a rigid demand, and the standardized training of rotating nurses is the core link of subspecialty construction [21]. Through QCC activities, this study formed a complete closed loop of "training—assessment—practical operation—review—optimization", precipitated a series of reusable resources such as standardized manuals, practical operation videos, inspection scales, and table setting specifications, and constructed a targeted and implementable training system for rotating nurses. This system is not only applicable to robot-assisted pancreaticoduodenectomy, but also can be adjusted according to the characteristics of different subspecialty surgeries, such as gastroenterology, hepatobiliary surgery, and urology, providing a feasible template for the large-scale and standardized training of specialist nurses in the operating room, and boosting the discipline construction and talent echelon improvement of the department.

4.5. Research limitations and future prospects

This study has certain limitations: first, it is a single-center, small-sample quasi-experimental study with a limited sample size, and there is a certain deviation in the extrapolation of results; second, the observation period is short, only the short-term rectification effect is verified, and the long-term effectiveness needs to be further confirmed; third, the indicators such as job competence and long-term retention rate of rotating nurses are not tracked. In future research, the sample size can be expanded, multi-center collaborative research can

be carried out, and the follow-up period can be extended to evaluate the long-term effectiveness of quality control measures; at the same time, QCC can be integrated with PDCA, 6S management and other tools to further optimize the nursing process; in addition, a job competence evaluation model for rotating nurses can be constructed to realize personalized and precise training and continuously improve the nursing cooperation ability of complex surgeries in the operating room.

5. Conclusion

QCC activities use scientific quality management tools to accurately focus on the pain points of rotating nurses in the cooperation of robot-assisted pancreaticoduodenectomy. Through systematic problem analysis, targeted countermeasure implementation, and full-process quality control, it can significantly improve the standardization rate of surgical cooperation, shorten the preoperative preparation time, reduce intraoperative cooperation errors, and improve the satisfaction of medical and nursing coordination. At the same time, a replicable professional training system for rotating nurses is constructed. This mode has strong operability and a remarkable improvement effect, which can effectively ensure the safety of complex robotic surgeries, improve the nursing quality and professional level of the operating room, and is worthy of popularization and application in the nursing quality control and talent training of operating room subspecialties.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Li ZL, Wang LJ, 2025, Analysis of the Effect of Robot-assisted Laparoscopic Surgery on the Quality of Life and Long-term Prognosis of Patients Undergoing Pancreaticoduodenectomy. Chinese Journal of Robotic Surgery (Chinese and English), 6(5): 808–812.

[2] Peng CH, Shi YS, 2015, Characteristics and Countermeasures of Pancreatic Fistula after Open, Laparoscopic and Robot-assisted Pancreaticoduodenectomy. Chinese Journal of Practical Surgery, 35(8): 824–827.

[3] Choi SH, 2022, Usefulness of the New Articulating Laparoscopic Instrument in Laparoscopic Pancreaticoduodenectomy. Journal of Minimally Invasive Surgery, 25(4): 161–164.

[4] Yang XY, Zhu KF, Hu Q, 2023, An Assessment of Perioperative Outcomes for Open, Laparoscopic, and Robot-assisted Pancreaticoduodenectomy. Journal of Surgical Oncology, 127(4): 752–754.

[5] He L, Zeng Y, Yu XF, et al., 2024, Chinese Expert Consensus on Nursing Cooperation in Robotic Surgery (2024 Edition). Chinese Journal of Robotic Surgery (Chinese and English), 5(2): 288–298.

[6] Yang D, Luo LK, Zheng SF, et al., 2025, Application of QCC Cluster Nursing Mode in the Perioperative Period of Robot-assisted Radical Resection of Colorectal Cancer. Chinese Journal of Robotic Surgery (Chinese and English), 6(5): 852–856.

[7] Lu LL, Dong PL, Qiao TT, et al., 2021, Application of Quality Control Circle activities in the Standardized Management of Orthopedic Surgical Instrument Tables. Nursing Practice and Research, 18(22): 3434–3437.

[8] Shen PP, Zhang Q, Lv XQ, et al., 2017, Causes and Improvement Measures of Intraoperative Failures of da Vinci Surgical Robot. Journal of Nursing Science, 32(12): 50–52.

[9] Zhang Q, Lv DZ, Yu N, et al., 2020, Construction of a Robotic Surgery Management Model under the ERAS Concept. Chinese Health Quality Management, 27(6): 91–95.

[10] Liao D, Yang B, Yang XY, et al., 2020, Application of BEST Training Method Combined with OSCE Assessment in on-the-job Training of Robotic Specialist Nurses. Nursing Practice and Research, 17(16): 4–7.

[11] Shen XF, Shi ZY, Zhou YF, et al., 2022, Training of da Vinci Robotic Surgery Nurses Based on Checklist Management. Journal of Nursing Science, 37(8): 34–36.

[12] Zhao GD, 2022, Robot-assisted Radical Antegrade Modular Pancreatosplenectomy. Chinese Journal of General Surgery (Electronic Version), 16(4): 368–371.

[13] Lu T, Li XY, 2020, Design and Application of an Assessment Form for Nursing Cooperation in da Vinci Robotic Surgery. Nursing Practice and Research, 17(10): 117–119.

[14] Liang MH, Liu TF, Dong SP, 2012, Research on the Application of Quality Control Circle in the Continuous Improvement of Medical Quality. Chinese Hospital Management, 32(2): 37–39.

[15] Chen SY, Bao AZ, Xie CX, et al., 2025, Construction and Empirical Study of a Modular Training Program for Nursing Cooperation in Robot-assisted Surgery. Chinese Journal of Nursing Education, 22(3): 313–320.

[16] Wang YY, Hong BF, Sun CX, et al., 2025, A Scoping Review of Training for Specialist Nurses in da Vinci Robotic Surgery. Chinese Journal of Robotic Surgery (Chinese and English), 6(5): 875–880.

[17] Rao Q, Lu XY, Chen RT, 2025, Research on the Current Situation of da Vinci Robotic Surgery Nurse Training Based on Job Competence. Chinese Journal of Robotic Surgery (Chinese and English), 6(2): 293–299.

[18] Yu XF, He MM, 2022, Application of Modular Training Mode in the Training of Robotic Surgery Cooperation. Chinese Journal of Robotic Surgery (Chinese and English), 3(3): 217–223.

[19] Hu Y, Qin ZL, Qin CH, et al., 2025, Discussion on the Training Program for Specialist Nurses in da Vinci Robotic Surgery. Journal of Minimally Invasive Medicine, 20(4): 486–489.

[20] Wu Z, Chen HB, Zhang XJ, 2018, Application of the Medical-nursing Integration Model in the Subspecialty Grouping of Orthopedics in the Operating Room. Journal of Nursing Science, 33(16): 39–41 + 44.

[21] Qin JN, Zhang YY, Chen QZ, et al., 2025, Application and Research Progress of Robotic Surgical System in the Field of Operating Room Nursing. Chinese Journal of Robotic Surgery (Chinese and English), 6(4): 607–612.