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Design and Application of Preoperative Checklist for Coronary Interventional Surgery Based on Multidisciplinary Collaboration

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Abstract: *Objective*: To design a preoperative checklist for coronary interventional surgery based on multidisciplinary collaboration, and verify its effect on improving the completeness rate of preoperative preparation, surgical punctuality, and medical staff satisfaction. *Methods*: A multidisciplinary team was established involving the Department of Cardiology, Anesthesiology, Clinical Laboratory, and Interventional Surgery. Referring to the latest clinical guidelines and nursing standards, a preoperative checklist covering 8 core modules and 61 sub-items was formulated, including "1 day before surgery + day of surgery" and "doctor + nurse + patient + family member". A total of 213 patients undergoing coronary interventional surgery in our hospital from August 2023 to February 2024 (observation group) were selected to apply the checklist. The completeness rate of preoperative preparation and the on-time operation start rate were compared with 197 patients (control group) before the checklist application. The satisfaction of 34 medical staff was evaluated using a Likert 5-point scale. *Results*: The overall completeness rate of preoperative preparation in the observation group reached 95.72% (78.17% in the control group), among which the completeness rates of 6 sub-items such as medication, health education, and laboratory examinations reached 100%, and the completeness rate of consumables and equipment preparation was 97.1%; the on-time operation start rate was 97.3%; the satisfaction of the medical team with the checklist was 94.12%, which was significantly higher than that of the control group (82.61%), with statistically significant differences ($p < 0.05$). *Conclusion*: The preoperative checklist for coronary interventional surgery designed through multidisciplinary collaboration can significantly improve the quality of preoperative preparation and surgical efficiency, and is highly recognized by the medical team, providing practical reference for perioperative safety management of interventional diagnosis and treatment.

Keywords: Coronary interventional surgery; Preoperative checklist; Multidisciplinary collaboration; Perioperative management

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1. Introduction

Coronary interventional surgery is a minimally invasive technology that delivers catheters to the root of the aorta through peripheral arterial routes such as the radial artery and femoral artery, performing diagnostic and therapeutic operations including coronary angiography, balloon angioplasty, stent implantation, optical coherence tomography, intravascular ultrasound, and Fractional Flow Reserve measurement [1,2]. Preoperative preparation, as a key link in perioperative management, its implementation and the efficiency of medical-nursing collaboration directly affect intraoperative safety and surgical progress [3–6]. As an efficient quality inspection tool, the checklist can achieve rapid verification of important links through standardized item design, ensuring medical quality and safety [7–9]. To optimize perioperative nursing quality and medical work efficiency, this study designed a preoperative checklist for coronary interventional surgery based on multidisciplinary collaboration, applied it to the nursing management of 213 patients, and verified its effect, aiming to provide reference for clinical practice.

2. Materials and methods

2.1. General information

(1) Observation group

A total of 213 patients undergoing coronary interventional surgery in our hospital from August 2023 to February 2024, including 109 males and 104 females, aged 28–93 years (average 65.23 years). All patients received local anesthesia, and the surgery was successfully completed with stable postoperative conditions.

(2) Control group

A total of 197 patients undergoing coronary interventional surgery before the checklist application (January–July 2023). The baseline data were balanced and comparable with the observation group ($p > 0.05$), indicating comparability.

2.2. Methods

2.2.1. Checklist design

A special team composed of medical staff was established, with the Department of Cardiology responsible for formulating surgical plans, the Department of Anesthesiology conducting anesthesia risk assessment, the Clinical Laboratory reviewing preoperative indicators, and the Interventional Surgery Department preparing consumables/equipment. Based on the Interventional Nursing Guidelines and the latest clinical guidelines for coronary interventional diagnosis and treatment, combined with clinical pain points such as missing preoperative examinations and lack of consumables, the core framework of the checklist was designed as follows [1,3].

(1) Time dimension

Covering 1 day before surgery (basic preparation) and the day of surgery (real-time verification);

(2) Subject dimension

Including 4 types of subjects: doctor preparation (surgical plan, anesthesia assessment), nurse preparation (skin care, preoperative health education), patient preparation (dressing, medication cooperation), and family member preparation (informed consent, cost confirmation);

(3) Specific content

Detailed into 8 core items (medication, skin, jewelry and dressing, consumables and equipment,

preoperative health education, intraoperative medication, laboratory/imaging examinations, family members and costs), with a total of 61 sub-items. Each sub-item defines a "completion standard" (e.g., "skin preparation" requires recording the skin preparation range and presence of damage).

2.2.2. Checklist application process

(1) Distribution

On the day of admission, the responsible nurse places the checklist in the medical record folder, marking key time nodes (e.g., completing skin preparation before 16:00 on the day before surgery);

(2) Filling and verification

The responsible nurse checks "√" after completing each item, and explains special situations (e.g., patient refuses to remove jewelry) in the remark column; the operating room nurse conducts a second verification during the follow-up visit on the day before surgery, and confirms with the responsible nurse without omissions;

(3) Handover and filing

Before patient transfer, personnel from the ward and interventional operating room conduct a two-person handover based on the checklist; after the operation, the nursing supervisor sorts out the checklist in chronological order and files it for 6 months for quality traceability.

2.2.3. Quality control

Problems in the use of the checklist are fed back at the monthly department meeting, such as "missing preoperative examinations", which are optimized through multidisciplinary team discussions: for example, adding prompt items such as "blood routine, liver and kidney function, cardiac ultrasound, and infectious disease screening" to the "laboratory and imaging examinations" item; the nursing supervisor randomly checks the standardization of checklist filling and counts the execution rate and completeness rate of each item.

2.2.4. Evaluation indicators and statistical methods

(1) Completeness rate of preoperative preparation

The completeness rate of a single item = (number of patients who completed the sub-item / total number of patients) × 100%, and the overall completeness rate is the average of the completeness rates of 8 single items;

(2) On-time operation start rate

Record the difference between the actual operation start time and the planned time, with ≤ 15 minutes considered on-time;

(3) Medical staff satisfaction

Evaluated using a Likert 5-point scale (very satisfied = 5 points, very dissatisfied = 1 point) from 3 dimensions: "information comprehensiveness, ease of use, and content accuracy". "Very satisfied + satisfied" were included in the satisfaction rate.

(4) Statistical methods

SPSS 26.0 software was used for analysis. Count data were expressed as rates (%), and inter-group comparisons were performed using χ^2 test. A p-value < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of completeness rate of preoperative preparation

The completeness rates of the 8 core items in the observation group were higher than or equal to those in the control group, with an overall completeness rate of 95.72% (78.17% in the control group), showing a significant difference ($p < 0.05$). Among them, the completeness rates of 4 items (medication, preoperative health education, intraoperative medication, laboratory and imaging examinations) reached 100%, the completeness rate of consumables and equipment preparation was 97.1%, and only the completeness rate of family member and cost preparation (84.6%) was basically the same as that of the control group (84.77%), as shown in **Table 1**.

Table 1. Comparison of completeness rate of preoperative preparation between the two groups (%)

Items	Medication preparation	Skin preparation	Jewelry and dressing preparation	Consumables and equipment preparation	Pre operative health education	Laboratory and imaging examinations	Family member and cost preparation	Overall completeness rate
Control group (n = 197)	83.77	88.83	89.85	90.86	76.29	91.88	84.77	78.17
Observation group (n = 213)	100.00	92.30	91.50	97.10	100.00	100.00	84.60	95.72
χ^2 value	42.15	3.98	0.52	12.37	68.51	23.64	0.01	102.43
p value	< 0.001	0.046	0.471	< 0.001	< 0.001	< 0.001	0.925	< 0.001

3.2. On-time operation start rate and medical staff satisfaction

The on-time operation start rate in the observation group was 97.3% (207/213), and that in the control group was 81.2% (160/197), with a statistically significant difference ($\chi^2 = 28.76$, $p < 0.001$). A total of 34 medical staff satisfaction questionnaires were distributed, with a recovery rate of 100%. The overall satisfaction rate in the observation group was 94.12% (32/34), including 95.65% (22/23) for nurses and 90.91% (10/11) for doctors; the overall satisfaction rate in the control group was 82.61% (28/34), including 82.61% (19/23) for nurses and 81.82% (9/11) for doctors, with significant inter-group differences ($p < 0.05$), as shown in **Table 2**.

Table 2. Comparison of satisfaction of medical teams between the two groups (n, %)

Group	Subgroup	Very satisfied	Satisfied	Generally satisfied	Dissatisfied	Satisfaction rate
Nurses (n = 23)	Control group	5	14	3	1	82.61
	Observation group	13	9	1	0	95.65
Doctors (n = 11)	Control group	3	6	2	0	81.82
	Observation group	6	4	1	0	90.91
Overall (n = 34)	Control group	8	20	5	1	82.61
	Observation group	19	13	2	0	94.12

4. Discussion

As a minimally invasive interventional diagnosis and treatment technology, the perioperative safety of coronary interventional surgery is highly dependent on multidisciplinary collaboration [1,6]. Targeting clinical problems such as “fragmented preoperative preparation and easy omissions in handover links”, this study designed a checklist

through multidisciplinary team collaboration, achieving three core values.

4.1. Standardizing the preoperative preparation process

The checklist integrates scattered links such as "doctor's plan formulation, nurse's skin preparation, and family member's informed consent" into 8 core modules [10]. The 61 sub-items define clear "completion standards", avoiding preparation omissions caused by differences in personal experience. For example, the completeness rates of medication and health education in the observation group reached 100%. This is consistent with the concept of the preoperative checklist for small intestinal transplantation designed by Cen Luoxu et al., both reducing the risk of human error through checklist-based approach [4].

4.2. Improving surgical efficiency and safety

The on-time operation start rate in the observation group reached 97.3%, significantly higher than that in the control group. The core reason is that the checklist clarifies the completion time limits for key links such as "consumables and equipment preparation" and "intraoperative medication", reducing surgical delays caused by lack of equipment and missing drugs; at the same time, the 100% completeness rate of laboratory and imaging examinations provides accurate basis for adjusting surgical plans, reducing perioperative risks [8].

4.3. Optimizing the medical-nursing collaboration experience

The 94.12% medical staff satisfaction indicates that the checklist simplifies the handover process (e.g., two-person verification mechanism), reducing redundant communication costs; nurses reported improved "information comprehensiveness", and doctors believed that "content accuracy" helps with preoperative risk assessment, which is consistent with the conclusion reported by Hall et al. that "neurosurgical postoperative checklists improve medical-nursing collaboration" [7].

5. Conclusion

This study has limitations: the completeness rate of family member and cost preparation did not improve significantly, which may be related to family members' insufficient understanding of the cost process. In the future, it is necessary to cooperate with the Finance Department to optimize the guidance content of "cost confirmation" in the checklist; in addition, the checklist needs to be dynamically updated with new technologies in coronary interventional diagnosis and treatment, such as the application of drug-eluting balloons.

In summary, the preoperative checklist for coronary interventional surgery based on multidisciplinary collaboration can effectively improve the quality of preoperative preparation and surgical efficiency, providing a promotable practical plan for perioperative safety management of interventional diagnosis and treatment.

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Disclosure statement

The authors declare no conflict of interest.

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