Trial Protocol

1.Cases collection

In clinical work, patients with breast cancer were randomly divided into two groups.

The participant inclusion criteria were: (I) Patients with breast cancer diagnosed by pathological examination and scheduled to undergo mastectomy; and (II) aged ⩾18 years old. This study was approved by the Wuhan Children's Hospital (Wuhan Maternal and Child Healthcare Hospital) ethics committee, and participants' informed consent was obtained via a signed form.

Participant exclusion criteria included: (I) patients who were unconscious or unable to communicate; (II) critically ill patients with advanced breast cancer with distant metastasis and multiple organ failure; (III) patients with dysfunction of the heart, lung, kidney, or another important organ; (IV) patients with mental disorders.

2.Study methods

Interventional methods

The control group was treated with routine nursing intervention. During treatment, the nursing staff observed and recorded patients' postoperative vital signs, and conducted health education, including in relation to medication and matters requiring attention after the operation. The observation group intervention included the assignment of a whole-process escort playing a relative role combined with mind mapping. The main contents of the nursing intervention in the observation group are as follows.

2.1 Whole-process escort playing a relative role

(I) Establishing the patient-nurse relationship: the nurses talked actively with patients who were about to undergo breast cancer surgery.after their admission to hospital to gain an understanding of their psychological state, family environment, social relations, economic status, and cognition of breast cancer,. The nurses established a good relationship with patients and addressed them as relatives. (II) Health education: the nurses explained the operating room environment and principle of the operation to the patients to ensure the patients had a certain understanding of their breast cancer surgery. The nurses encouraged the patients to ask questions, and gave meticulous and comprehensive answers to familiarize the patients with the instruments and equipment which would be used during the operation. Furthermore, the nurses introduced the

surgical medical staff to the patient to improve their familiarity. (III) Psychological nursing: the nurses accompanied the patients throughout the entire process, acting as relatives, and provided timely targeted guidance when patients were under psychological pressure, such as diverting their attention, talking, etc., to guide patients to meditate and have relaxed and happy thoughts. The nurses also accompanied the patients during the operation and assisted patients in getting through the operation smoothly.

2.2Mind mapping

(I) Designing the mind map: the mind map was divided into 3 second-level branches (before, during and after surgery), centering on the perioperative nursing of breast cancer patients. The map included: 3 preoperative third-level branches: admission guidance, preoperative preparation, and psychological nursing; 2 perioperative third-level branches: warmth and psychological nursing; and 4 postoperative third-level branches: nursing methods for bleeding, subcutaneous effusion, upper limb swelling, and skin flap necrosis. After completing the design, we make a tree view, used bright colors and pictures, and used the mind-mapping software Mind Manager to draw the map, .which was printed on paper, covered the outside with plastic for long-term use . (II) Implementation of mind mapping: The nurses were trained in mind mapping, which required them to fully understand and remember the mind mapping, and to carry out clinical nursing work according to the mind map. (III) Follow-up investigation: We regularly asked all the nurses to retrospectively analyze any problems in the implementation of the mind map. With the combination of literature and clinical nursing experience, we gradually improved the mind map to make the nursing work plan more perfect.

2.3ndex detection method

Fasting venous blood (5 mL) was collected from the participants at admission and before surgery, and plasma was collected by centrifugation. The levels of cortisol (cortisol, Cs) and adrenocorticotropic hormone (ACTH) were determined by radioimmunoassay.

3. Evaluation criteria

3.1 Mental state

The Hamilton anxiety scale (HAMA) , which comprises 14 items, was used to assess the participants' anxiety. Using the scale, each item is given a score of 0 to 4 points, with the total score ranging from 0 to 56 points; the higher a patient's score, the more severe their anxiety. The Hamilton depression scale (HAMD), which includes 17 items, was used to assess the participants' depression. Each item in the scale is scored from 0 to 4 points, with a total score range of 0 to 68 points; the higher a patient's score, the more severe their depression.

3.2 Fatigue degree

The Piper fatigue scale was used to evaluate the degree of cancer-related fatigue. The scale includes 5 dimensions: behavior, emotion, feeling, cognition, and station. The higher the score, the more severe the fatigue.

3.3 Sleep quality

The Pittsburgh sleep quality index (PSQI) scale (10) was used to evaluate the participants' sleep quality. The scale comprises 24 items, each of which is given a score of 0 to 3 points, with a total score range of 0 to 21 points; the higher the score, the poorer the sleep quality.

3.4 Observation index

The mental state (HAMA and HAMD scales), physiological stress (Cs and ACTH levels), fatigue degree (Piper fatigue scale), and sleep quality (PSQI) were compared between the observation and control groups at admission and before surgery.

4. Statistical methods

Data were analyzed using SPSS22.0 software(International Business Machines Corporation, United States). Counting data were expressed by rate (%), comparisons between groups were performed using the χ^2 test. Measurement data were expressed by ($x\pm s$), and the independent-samples *t*-test was used for comparisons between groups. $P<0.05$ indicated a significant difference between the 2 groups.

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