

## Original Article

# Cluster nursing can reduce postoperative delirium and improve the negative emotions and quality of life of elderly ICU patients

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**Abstract:** Objective: To explore the application effect of cluster nursing in post-surgery elderly patients in intensive care units (ICU). Methods: From March 2019 to August 2020, a total of 167 elderly patients admitted to the ICU in Changzhou No. 2 People's Hospital, the Affiliated Hospital of Nanjing Medical University were recruited as the study cohort. They were divided into a test group (n=85) and a control group (n=82). The patients in the control group underwent routine nursing, and the patients in the test group underwent cluster nursing in addition to the nursing the control group underwent. The two groups' incidences of delirium, their quality of life, and their mental health were compared. Results: The total incidences of delirium in the test group were significantly lower than they were in the control group, and the delirium outcome rate was significantly higher than it was in the control group. A comparison of the Acute Physiology and Chronic Health Evaluation (APACHE II) and Symptom Checklist-90 (SCL-90) scores before and after the nursing showed that the test group had notably lower scores than the control group. In addition, the nursing satisfaction rate in the test group was 88.24%, which was significantly higher than the rate in the control group (73.17%). The hospitalization expenses of the test group were lower, with a notably improved quality of life. Conclusion: Cluster nursing can reduce the incidence of delirium and improve the quality of life and mental health of post-surgery elderly ICU patients.

**Keywords:** Cluster nursing, intensive care unit, elderly, delirium, quality of life

## Introduction

Delirium is an acute, transient, and usually reversible neuropsychiatric syndrome that occurs at all ages, and the elderly are at a high risk of developing delirium [1]. Elderly patients in intensive care units (ICU) are often in critical condition and are prone to negative emotions and delirium after their operations [2]. The consequences of delirium are long-term, including increased mortality and morbidity, long-term cognitive dysfunction and memory loss, an increased risk of falls, and a decreased functional status [3]. According to previous studies, delirium is associated with various negative consequences, such as long hospital stays, the need for institutional care, poor function, and high treatment costs, and it has also been proved to be related to higher short-term and long-term mortality [4]. Delirium has also been

shown to be related to the severe pain of patients and their families, which seriously affects their quality of life [5]. Therefore, it is of great importance to prevent the occurrence of delirium in ICU patients. It is also important to find this phenomenon as early as possible and carry out nursing management to reduce the related morbidity, mortality and pain of the patients and their caregivers [6].

Cluster nursing intervention is a centralized and targeted management model that can be adopted for the same kind of patients by combining a series of evidence-based treatment and nursing measures, and it can help medical personnel provide patients with optimal medical care services and nursing outcomes as much as possible [7]. According to Leslie et al., long-term care effectively prevented delirium and reduced the medical costs of 801 inpa-

tients aged 70 and above [8]. It is particularly important to determine the risk of delirium in terms of prevention. In the needs-based nursing model, nursing assessment is a useful component of the risk assessment of mental disorders, so it is necessary to develop a personalized nursing system [9]. Given the high risk of delirium, it would be beneficial to improve the nursing level of postoperative delirium in elderly ICU patients [10]. There have been no previous studies on the prevention of delirium in elderly ICU patients using the cluster nursing model or on the improvement of patients' negative emotions and quality of life. It is not yet known whether cluster nursing can promote patient rehabilitation.

In this study, a cluster nursing intervention was administered to elderly ICU inpatients to analyze the impacts of this model of care on the occurrence of postoperative delirium, negative emotions, and quality of life.

### Materials and methods

#### *General data*

From March 2019 to August 2020, a total of 167 elderly patients admitted to the intensive care unit (ICU) of Changzhou No. 2 People's Hospital, the Affiliated Hospital of Nanjing Medical University were recruited as the study cohort. Inclusion criteria: patients aged 60 years old or above, patients with complete clinical data, patients with no delirium before their admission, and patients with an ICU stay time equal to or longer than 24 hours. Diagnostic criteria of delirium: clinically, patient was experiencing a cloudy state of consciousness or showed abnormal mental excitement, symptoms of restlessness, resistance, shouting, and rich delusions and hallucinations [11]. Exclusion criteria: patients with a previous history of cerebrovascular epilepsy, mental illness, acute cerebrovascular disease, neurosurgery, or malignant tumors. This study did not violate ethics. The plan was submitted to the Ethics Committee of Changzhou No. 2 People's Hospital, the Affiliated Hospital of Nanjing Medical University for review, and it was implemented after the approval was obtained. All the subjects and their guardians signed a fully informed consent form.

#### *Methods*

The enrolled 167 patients were divided into a test group (n=85) and a control group (n=82). The patients in the control group underwent routine nursing. According to the ICU nursing procedures, the patients were provided with oxygen support and electrocardiograph (ECG) monitoring, and their vital signs were monitored throughout the whole process. Any seepage or bleeding in the patients was properly handled during the observation. In addition, the patients underwent medication nursing and complication prevention nursing based on the doctor's advice. The patients in the test group underwent clustered nursing in addition to the nursing the control group underwent. The specific measures were as follows: according to the cultural background, the clinical data, and the medical history of each patient before admission, his/her psychological state was comprehensively evaluated. The nurses carried out the nursing work seriously and implemented the nursing tasks practically. The charge nurses took the initiative to care about the patients with delirium after their operations, patiently asked them whether they had discomfort or needs, actively encouraged them and helped them exercise as soon as possible, so as to make the patients have trust in the nurses. In the nursing process, the charge nurses were required to reduce the movement range, keep the proper humidity and temperature in the ward, keep the light in the ward soft, reduce the overall noise in the room, and ensure that the patient had enough sleep from 10 pm to 7 am the next day. The patients were encouraged to take deep breaths, cough effectively, and blow up balloons. They were instructed to maintain a reasonable diet. When the patient was able to eat, the intake of food and water was controlled to maintain a balanced diet. The charge nurses strictly checked the indexes related to delirium, such as blood oxygen saturation, consciousness, and blood pressure, so as to enable an early determination of delirium. If the patient was manic, extremely quiet, or had difficulty speaking, it was necessary to guard against the occurrence of delirium and to identify postoperative delirium early. When cleaning the patient's body and urethral orifice, a curtain was needed, and the time and range of the patient's body exposure were reduced, so as to make the patient feel respected.

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**Table 1.** General clinical data of the test and control groups (means  $\pm$  SD); [n (%)]

| Type                   | Control group<br>n=82 | Test group<br>(n=85) | t/ $\chi^2$<br>value | P<br>value |
|------------------------|-----------------------|----------------------|----------------------|------------|
| Age (years)            | 70.3 $\pm$ 3.5        | 71.1 $\pm$ 2.6       |                      |            |
| Gender                 |                       |                      | 0.047                | 0.828      |
| Male                   | 43 (52.44)            | 46 (54.12)           |                      |            |
| Female                 | 39 (47.56)            | 39 (45.88)           |                      |            |
| Disease type           |                       |                      | 2.855                | 0.582      |
| Fracture               | 16 (19.51)            | 21 (24.71)           |                      |            |
| Intestinal obstruction | 10 (12.20)            | 8 (9.41)             |                      |            |
| Gallstone              | 11 (13.41)            | 7 (8.24)             |                      |            |
| Tumor                  | 21 (25.61)            | 18 (21.18)           |                      |            |
| Other                  | 24 (29.27)            | 31 (36.47)           |                      |            |
| ASA grade              |                       |                      | 0.458                | 0.795      |
| Grade I                | 21 (25.60)            | 18 (21.18)           |                      |            |
| Grade II               | 51 (62.20)            | 56 (65.88)           |                      |            |
| Grade III-IV           | 10 (12.20)            | 11 (12.94)           |                      |            |
| Operation time (h)     | 1.76 $\pm$ 0.62       | 1.81 $\pm$ 0.79      |                      |            |
| Smoking history        |                       |                      | 0.251                | 0.616      |
| Present                | 33 (40.24)            | 31 (36.47)           |                      |            |
| Absent                 | 49 (59.76)            | 54 (63.53)           |                      |            |
| Drinking history       |                       |                      | 0.069                | 0.792      |
| Present                | 35 (42.68)            | 38 (44.71)           |                      |            |
| Absent                 | 47 (57.32)            | 47 (55.29)           |                      |            |
| Diabetes history       |                       |                      | 0.049                | 0.825      |
| Present                | 6 (7.32)              | 7 (8.24)             |                      |            |
| Absent                 | 76 (92.68)            | 78 (91.76)           |                      |            |
| Hypertension           |                       |                      | 0.003                | 0.953      |
| Present                | 5 (6.10)              | 5 (5.88)             |                      |            |
| Absent                 | 77 (93.90)            | 80 (94.12)           |                      |            |

**Table 2.** Comparison of the delirium incidences between the test and control groups in the different time periods [n (%)]

| Group          | n  | Less than<br>24 h | 24 h-72 h  | 72 h to<br>discharge | Total<br>incidence |
|----------------|----|-------------------|------------|----------------------|--------------------|
| Control group  | 82 | 5 (6.10)          | 10 (12.20) | 21 (25.61)           | 36 (43.90)         |
| Test group     | 85 | 1 (1.18)          | 4 (4.71)   | 10 (11.76)           | 15 (17.65)         |
| $\chi^2$ value | -  | 2.918             | 3.048      | 5.292                | 1.560              |
| P value        | -  | 0.088             | 0.081      | 0.021                | <0.001             |

### Outcome measures

The incidence of delirium in the patients was observed at the time periods of below 24 h, 24 h-72 h, and 72 h to discharge. The delirium outcomes were observed and divided into three grades: Cured: the patients had no coma and had a clear consciousness, their attention

could be concentrated effectively, and their unstable mental state disappeared completely. Improved: the patients had a clear consciousness, they could concentrate, and their mental state was stable, with no logical confusion. No response: the patients' delirium symptoms did not change or even worsened. Outcome rate = (cured + improved)/n  $\times$  100%. The acute physiology and chronic health evaluation (APACHE II) score system [12] was used to evaluate the patients' health statuses before and after the nursing. The APACHE II scoring standard is composed of acute physiology, age, and chronic health scores, and each patient's final score is expressed as the sum of the 3 items, with a maximum possible score of 71. The higher the score, the worse the patient's physical condition. Symptom Checklist-90 (SCL-90) [13] was used to evaluate the patients before they were admitted to the ICU and after the nursing. It mainly assessed the patients' obsessive-compulsive symptoms, including their sensitive interpersonal relationships, their emotions, somatization, psychosis, and other items. Each item used a five-level scoring system, and the higher the score, the worse the mental state of the patient. Before discharge, the nursing satisfaction of patients and their families was measured and recorded. A self-made nursing satisfaction questionnaire was used [14], which covers service attitude, operation standards, and other items. A score of over 90 points indicates greatly satisfied, a score of 80-90 points indicates satisfied, a score of 70-79 points indicates generally satisfied, and a score of less than 70 points indicates dissatisfied. Nursing satisfaction = (great satisfied + satisfied)/n  $\times$  100%. The patients' lengths of stay of patients were recorded. The short form 36-item health survey (SF-36) [15] was used to evaluate the

**Table 3.** Comparison of the delirium outcome rates between the test and control groups [n (%)]

| Group          | n  | Cured      | Improved  | No response | Outcome rate |
|----------------|----|------------|-----------|-------------|--------------|
| Control group  | 36 | 14 (38.89) | 6 (16.67) | 16 (44.44)  | 55.56        |
| Test group     | 15 | 7 (46.67)  | 6 (40.00) | 2 (13.33)   | 86.67        |
| $\chi^2$ value | -  | -          | -         | -           | 4.488        |
| P value        | -  | -          | -         | -           | 0.034        |

patients' quality of life, including role physical (RP), general health (GH), social function (SF), physiological function (PF) and role emotional (RE). The range of each item is 20-100 points, and a higher score indicated a better quality of life.

*Statistical methods*

All the statistical analyses were performed using SPSS 20.0 (IBM Corp., Armonk, New York, USA). Mean  $\pm$  standard deviation (Mean  $\pm$  SD) was used to standardize the data, and Student's t tests were used to compare the significance of the data. The count data were expressed as [n (%)], and chi-square tests were applied for the comparisons between groups. Paired t tests were used for the intra-group comparisons.  $P < 0.05$  was considered statistically significant.

**Results**

*General data*

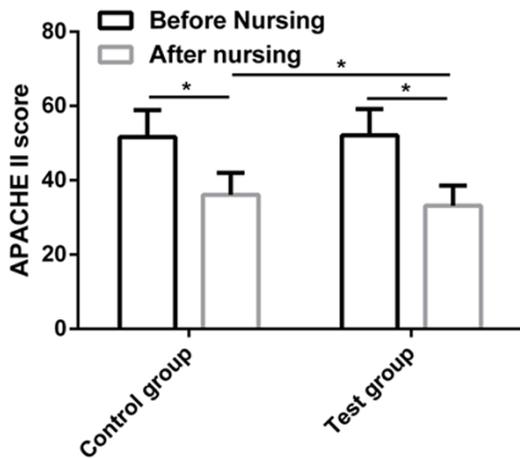
Through observation and the study of the general clinical data of the test group and the control group, we found no significant differences in terms of age, gender, disease type or ASA operation grade between them ( $P > 0.05$ ), as shown in **Table 1**.

*Comparison of the delirium in different time periods between the test group and control group*

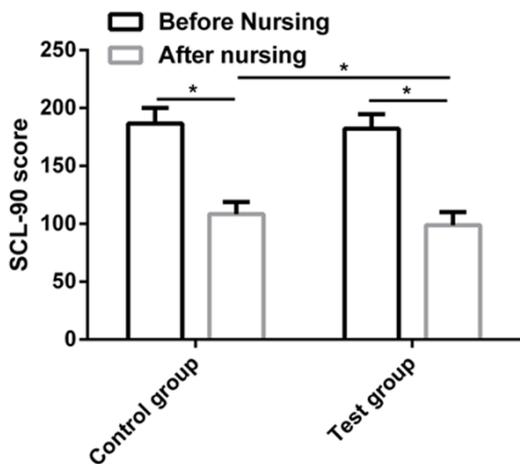
After the mechanical ventilation, the incidences of delirium in the different time periods were observed in the two groups, and we found no differences in the incidences of delirium at the time periods of below 24 h and 24 h-72 h ( $P > 0.05$ ). At the period of 72 h to discharge, however, the incidences of delirium in the test group were remarkably lower than they were in the control group ( $P < 0.05$ ). Additionally, the total number of incidences of delirium was also significantly lower in the test group than it was in the control group ( $P < 0.05$ ). More details are shown in **Table 2**.

*The delirium outcomes in the test and control groups*

The two groups' delirium outcomes were observed, and they were 55.56% in the control



**Figure 1.** The APACHE II scores before and after the nursing in the test and control groups. After the nursing, the APACHE II scores decreased remarkably in both groups ( $P < 0.05$ ) and were significantly lower in the test group than the control group ( $P < 0.05$ ). Note: \* $P < 0.05$ .

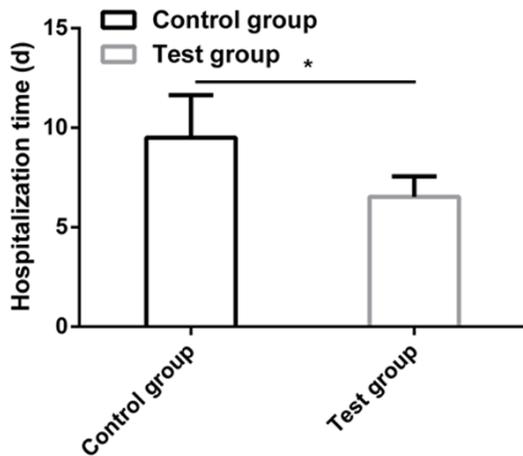


**Figure 2.** Changes in the SCL-90 scores before and after the nursing in the test and control groups. After the nursing, the SCL-90 scores decreased notably in both groups ( $P < 0.05$ ), and they were lower in the test group than they were in the control group ( $P < 0.05$ ). Note: \* $P < 0.05$ .

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**Table 4.** Comparison of the nursing satisfaction in the test and control groups [n (%)]

| Group          | n  | Greatly satisfied | Satisfied  | Generally satisfied | Dissatisfied | Satisfaction degree |
|----------------|----|-------------------|------------|---------------------|--------------|---------------------|
| Control group  | 82 | 35 (42.68)        | 32 (39.02) | 12 (14.63)          | 3 (3.66)     | 81.71               |
| Test group     | 85 | 51 (60.00)        | 29 (34.12) | 4 (4.71)            | 1 (1.18)     | 94.12               |
| $\chi^2$ value | -  | -                 | -          | -                   | -            | 6.098               |
| P value        | -  | -                 | -          | -                   | -            | 0.014               |



**Figure 3.** Comparison of the lengths of stay in the test and control groups. The lengths of stay in the test group were notably shorter than they were in the control group. Note: \* $P < 0.05$ .

group and 86.67% in the test group. The latter group had a significantly higher delirium outcome rate ( $P < 0.05$ ). More details are shown in **Table 3**.

### *The APACHE II scores before and after the nursing in the test and control groups*

Before the nursing, the APACHE II scores of the two groups showed no significant change. After the nursing, the scores decreased remarkably in both groups ( $P < 0.05$ ) and were significantly lower in the test group than in the control group ( $P < 0.05$ ). More details are shown in **Figure 1**.

### *Changes in the SCL-90 scores before and after the nursing in the test and control groups*

There was no considerable change in the SCL-90 scores between the test group and the control group before the nursing ( $P > 0.05$ ). After the nursing, SCL-90 scores decreased notably in both groups ( $P < 0.05$ ), and they were lower in the test group than they were in the control group ( $P < 0.05$ ). More details are shown in **Figure 2**.

### *Nursing satisfaction in the test and control groups*

The nursing satisfaction was investigated in both groups. It was 88.24% in the test group, which was significantly higher than it was in the control group (73.17%) ( $P < 0.05$ ). More details are shown in **Table 4**.

### *Length of stay in the test and control groups*

The length of stay in the test group was  $(6.53 \pm 1.02)$  d, which was notably less than it was in the control group  $(9.51 \pm 2.13)$  d ( $P < 0.05$ ). More details are shown in **Figure 3**.

### *Quality of life in the test and control groups*

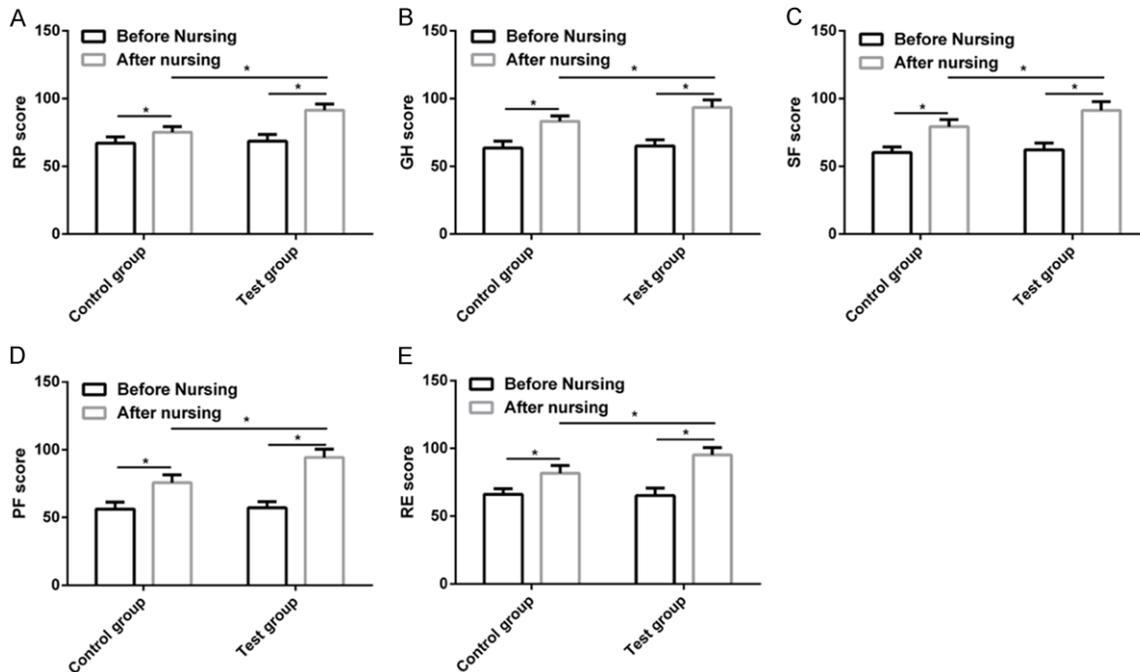
Before the nursing, there was no remarkable difference in the quality of life scores between the two groups ( $P < 0.05$ ). After the nursing, the quality of life scores improved notably in both groups ( $P < 0.05$ ), and they were higher in the test group than they were in the control group ( $P < 0.05$ ). More details are shown in **Figure 4**.

## Discussion

Delirium, depression, anxiety and other problems often occur in post-surgery elderly ICU patients, problems which seriously affect the effect of the surgical treatment and increase the risk of death after operation [16]. Therefore, for elderly ICU patients who develop post-operative delirium and negative emotions, the medical staff should provide an appropriate model of care.

Delirium can occur for a variety of reasons, making it difficult to achieve good clinical outcomes with a single model of care [17]. For example, Spronk et al. mentioned in their study that the ICU nurses seriously neglected delirium in their daily nursing, and proposed that more attention should be paid to the implementation of validated delirium screening tools

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**Figure 4.** Comparison of the quality of life scores in the test and control groups. A. Comparison of the RP scores between the test group and the control group. B. Comparison of the GH scores between the test group and the control group. C. Comparison of the SF scores between the test group and the control group. D. Comparison of the PF scores between the test group and the control group. E. Comparison of the RE scores between the test group and the control group. Note: \* $P < 0.05$ .

in routine ICU care [18]. According to Forsgren et al., people have a poor understanding of delirium in the ICU, and they suggested that medical staff should be educated to improve the nursing quality for ICU patients [19]. Cluster nursing aims to implement targeted nursing intervention for patients on the basis of evidence-based treatment, and it can improve patient outcomes. After an operation, with the extension of the mechanical ventilation time, the incidence of delirium will increase in ICU patients [20]. Our research shows that delirium usually occurs at 72 hours post-operation, and the incidences of delirium in the patients undergoing cluster nursing were significantly reduced, and their outcomes were also notably better when compared with the control group. These findings indicate that cluster nursing can reduce the incidences of delirium in elderly ICU patients and improve the outcomes of delirium patients. Our study further revealed that the APACHE II scores in the test group were lower than the corresponding scores in the control group, and the SCL-90 scores were significantly higher. The APACHE II score is a commonly used scale for the assessment of patients' dis-

ease severity, and the SCL-90 score can evaluate patients' mental health [21, 22]. In the study by van den Boogaard et al. [23], educating the nursing staff about delirium in the ICU can improve the quality of care. The application of a delirium assessment tool in the ICU allows for the early detection of delirium and the patients' ability to undergo haloperidol treatment at lower doses, and with a shorter duration. Our study, however, focuses more on the effective reduction of the incidence of delirium and its effects on the subsequent patient recovery. It is believed that increased communication between nurses and the patients during the nursing process facilitated this improvement, as it can help the nurses promptly understand each patient's condition. In addition, targeted nursing intervention in the patient's environment, psychology, and diet can improve the patient's condition significantly. Therefore, the implementation of the cluster nursing model can promote patient rehabilitation. According to the research of Boot et al., delirium is related to prolonged ventilation, related risks, and increased lengths of stay, which increase the medical costs of the pati-

ents and of national health services [24]. After cluster nursing, we found that the patients' lengths of stay were significantly shortened and their nursing satisfaction was higher in comparison with the control group, and their quality of life was significantly improved, indicating the significant intervention effect of cluster nursing.

This study confirms that cluster nursing has a good effect on post-surgery elderly ICU patients. However, there are still some deficiencies. First of all, we did not analyze the risk factors for postoperative delirium. Second, it is not known whether cluster nursing is suitable for other diseases. More in-depth research will be conducted in future studies.

In conclusion, cluster nursing can reduce the incidence of delirium and improve the quality of life and mental health of post-surgery elderly ICU patients.

### Disclosure of conflict of interest

None.

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