



# Effect of Early Multidisciplinary Collaboration Combined with Cluster Strategy on Acquired Debilitating Syndrome in ICU of Patients with Acute Myocardial Infarction

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## Abstract

**Background:** To investigate the preventive effect of early multidisciplinary collaboration combined with cluster strategy on acquired frailty syndrome in ICU of patients with acute myocardial infarction (AMI).

**Methods:** A total of 240 patients with myocardial infarction (MI) admitted to ICU in The Third Affiliated Hospital of Qiqihar Medical University, Qiqihar, China from March 2018 to March 2020 were selected. The patients were randomly divided into experiment group and control group equally according to random number method. The experimental group was treated with early multidisciplinary collaboration and cluster strategy, while the control group was treated with routine nursing mode. Duration of ventilation, total length of stay, length of ICU stay, New York College of Cardiology cardiac function classification, MRC-Score, BI and complications during hospitalization were recorded.

**Results:** After intervention, there were statistically significant differences in ventilation duration, total length of stay, length of stay in ICU, Heart function classification of New York Cardiology Society, MRC-Score, BI index, SF-36 score and complications during hospitalization in 2 groups ( $P < 0.05$ ), and the above indicators in the experimental group were better than those in the control group.

**Conclusion:** Early multidisciplinary collaboration combined with cluster strategy can significantly reduce the incidence of AMI in ICU of MI patients.

**Keywords:** Acute myocardial infarction; Multidisciplinary collaboration; Bunching strategy

## Introduction

Intensive care unit acquired weakness (ICU-AW) is a more common neuromuscular dysfunction during hospitalization in ICU, which mainly involves extremity muscles and respiratory muscles,

and seriously affects the quality of survival and life safety (1,2). For the moment, there is no specific drug for the treatment of ICU-AW, so the early prevention of its occurrence is particularly



critical (3). Previous studies showed (4,5) that due to the lack of integrity and pertinence, the traditional ICU care mode has difficulties in preventing this disease.

To this end, the research group applied the early multidisciplinary collaboration combined with cluster strategy to ICU nursing in patients with acute myocardial infarction (AMI).

## Methods

### *Research objects*

A total of 240 patients with MI admitted to the ICU of The Third Affiliated Hospital of Qiqihar Medical University, Qiqihar City, China from March 2018 to March 2020 were enrolled. They were randomly divided into experiment group and control group according to the random number method, with 120 patients in each group. There was no significant difference between the general data of the two groups. Inclusion criteria: 1, Patients with acute attack of myocardial infarction; 2, Patients greater or equal to 18 years old; 3, Patients who cooperate with the experiment and daily nursing diagnosis and treatment; Exclusion criteria: 1, Patient less than 18 years old; 2, Patients with combined fractures or previous history of fractures; 3, Patients with brain injury, stroke or neuromuscular diseases; 4, Patients with admission time  $\leq 24$  hours; 5, Patients with mental illness who are unable or refuse to cooperate with the study.

This study has been approved by the Ethics Committee of our hospital (Approval No. 2022LW-2), and all patients participating in the study have signed the informed consent form.

### *Research methods*

Before implementing this project, our department has established a perfect clustered Diagnosis and Treatment Group. The leader of the Diagnosis and Treatment Group was jointly served by the director of the ICU Department and the chief nurse. The members of the Diagnosis and Treatment Group include 1 professional clinician, 1 rehabilitation physician and 2 bed nursing

nurses. Group discussion was conducted and the cluster diagnosis and treatment specification and specific operation steps were formulated, with appropriate quantitative evaluation standard. The result of the discussion was sorted out and summarized by the group leader. Systematic training is conducted by the department director and chief nurse for the doctors and nurses in the form of teaching. After the training, the group members were assessed, and only those who pass the assessment could participate in the study.

### *Specific content for implementation*

The therapeutic intervention was performed with an early multidisciplinary collaboration combined with an ABCDE centralization strategy immediately upon entry.

AB: Spontaneous awakening and breathing coordination intervention. Spontaneous awakening trials (SATs) and spontaneous breathing trials (SBTs) were performed by a bed nursing nurse and a respiratory therapist at 09:00 and 16:00 every day for the patients to assess their respiratory safety. During the experiment period, the changes of vital signs in tested patients and the judgment criteria were strictly observed. Two nursing nurses and the respiratory therapist were required to be present at the same time, to record the experimental results in detail. The next stage of evaluation could be carried out after both results were qualified. In case of any sudden adverse reactions such as dyspnea during the trial, the trial should be terminated immediately, and emergency treatment should be conducted.

C: Selection of sedative drugs. According to the degree of pain and the Recommendations for Guidelines for Analgesia and Sedation in ICU, the reasonable pain relief and sedative drugs were chosen by the physician in charge. And the patient's pain was needed to be controlled by the recommended score of the Richmond Agitation and Sedation Scale (RASS), namely 1-2. This table was presented by Ramsay in 1974, with a reliability of 0.94 (6), Level 6 in total, Level 1 for lack of sedation, Level 2-4 for ideal state and Level 5-6 for over sedation.

The bed nursing nurse timely performs the doctor's advice and observe the patient's pain changes, so as to timely adjust the drug pump speed and feedback to the doctor.

D: False evaluation and management. The mental status was assessed by RASS at 09:00 every day. If the assessment score was >-3, the intensive care unit (Confusion Assessment Method for Intensive Care Unit, CAM-ICU) (7), The results were assessed by a psychiatrist.

E: Early rehabilitation activities. After the patient enters the department, the nurse assists the rehabilitation physician to conduct systematic rehabilitation exercises for the patient. During the treatment, the cardiologist needs to participate in the treatment, which is conducted 30 times a day, 10-15 min each time. Rehabilitation treatment consists of five stages according to extremities muscle strength: 1. Main and passive activity training for limbs and chest; 2, increase turn-around movement; 3. ensure the stability of vital

signs; 4, increase standing activity beside bed; 5. increase underground activity. When the extremities muscle strength score is <3, personalized training methods should be designed according to the patient's own condition, and the training strength should be adjusted in time. The rehabilitation intervention time should be combined with the cardiologist, and the starting time of treatment is decided according to the opinions of the doctor to prevent the occurrence and aggravation of complications such as heart failure caused by prematurely moving patients. During the process of rehabilitation treatment, the changes of vital signs are also closely monitored. If the heart rate is > 130 times / <50 times / min / min, or there were sudden decline in blood pressure, sudden increase in respiratory frequency, continuous decline in blood oxygen, patient complaint discomfort, or electrocardiographic monitoring shows arrhythmia, the trial should be stopped immediately (Table 1).

**Table 1:** Implementation process of the test group

<i>Project</i>	<i>Content</i>
Intervention time node	Into the department, immediately
Intervention frequency	everyday
Intervention Content (ABCDE)	Daily arousal and respiratory coordination intervention Selection of sedation medication False evaluation and management Early rehabilitation activities
handlers	Specialists in various disciplines, the ICU care team
Specific implementation steps	SATs and SBTs were performed according to their awareness and respiratory function to assess their respiratory safety, record test data in detail and evaluated by respiratory physicians. According to the evaluation results and treatment opinions, ICU tube doctors and nurses adjusted the corresponding treatment strategies.
Selection of sedation medication	According to the pain degree of the patient, the ICU chief physician consulted with the anesthesiologist to choose the appropriate sedative and pain medication, which was performed by the bed nursing nurse and tested for the patient's pain improvement and recorded in time.
False evaluation and management	The mental status was assessed by ICU bed nursing nurses and doctors by RASS, and the evaluation results were analyzed by the psychiatrist with corresponding guidance
Early rehabilitation activities	The individualized rehabilitation training plan is formulated by the rehabilitation physician, the cardiologist assists to optimize the rehabilitation strategy, the rehabilitation physician performs the patient rehabilitation training, and the ICU bed nursing nurse assists the rehabilitation physician for the treatment. The change of patients' vital signs should be tested in the whole process of rehabilitation treatment.

### **Data collection and quality control**

At each stage of the trial, the specialist is required to assist in the treatment. All indicators of patients should be evaluated and carefully filled in by nurses and doctors. After the daily data are filled in, they should be collected, counted and stored by special personnel. During the period, the chief nurse should participate in and supervise the whole process.

### **Control group interventions**

This group of patients adopts the routine care mode, that is, the patient explains the condition according to the patient's condition, and introduces the relevant rules and regulations of ICU. The patient's mental tension and anxiety should be relieved according to the patient's inner needs and the degree of consciousness. The patient's vital signs were closely monitored. If there are abnormal indicators, the nurses should report to the bed physician in time and assist the doctor with the problem.

### **Evaluating indicator**

General data of the two groups were recorded and counted by special personnel, including age, gender, education, working status, etc. At the same time, the duration of ventilation, total days, ICU hospitalization, New York Society of Cardiology, relevant evaluation scale scores and complications during hospitalization, such as deep vein thrombosis and pressure ulcers were recorded. The New York Society of Heart Disease Heart function classification is proposed by the New York Heart Association (NYHA) in 1928, and this classification method is simple to operate, so it is still often used in clinical practice. This grading system is divided into four levels, indicating the worse cardiac function. The Acute Physical and Chronic Health score (APACHE II) was used to assess patient disease severity, as proposed by Knaus in 1981 (8). It consists of three parts, namely, the acute physiological score, the age score, and the chronic health score. The total score is 71, below 15 = severe and the

above 15 = non-severe. Patient muscle strength was evaluated using the Medical Research Council score (MRC-score) (9). This score is the current clinically recognized diagnostic standard of ICU-AW. It evaluates the activity of 6 major joints with a full score of 60 and a total score of less than 48, which can make the diagnosis of ICU-AW. Self-care ability was assessed using the Barthel (BI) index assessment table (10). The evaluation content of this table includes 10 items of eating, bathing, dressing, control, urine, full score of 100, <20 means serious functional defects, 20-40 means patients need great help in daily lives, 40-60 means patients need help, > 60 means patients can take care of themselves. Quality of life (SF-36) score is developed in 1988 Stewartse medical outcome research scale (medical outcomes study-short form, MOS SF), based on the development of Boston health research, This table consists of physical function, body role, body pain, health, vitality, social function, emotional role and mental health eight dimensions to score patients, the higher the score, the better the quality of life.

### **Statistical Methods**

Data statistics of this study were analyzed by SPSS 20.0 software (IBM Corp., Armonk, NY, USA). Measurement data were described by  $\bar{x} \pm s$ . Independent sample t-test was used for difference comparison. Count data were described by percentage.  $\chi^2$  was used for statistical analysis. Inspection level = 0.05.

## **Results**

### **Comparison of the general patient data**

A total of 240 patients were included in this study, 2 died in the experiment group, and 3 were transferred to other hospitals, remaining 115 during the trial. In the control group, 6 patients died, 2 transferred, remaining 112. No general data between the two groups (Table 2).

**Table 2:** Comparison of the general data between the two patient groups

<i>Project</i>		<i>Test group (n=115)</i>	<i>Control group (n=112)</i>	<i>P price</i>	<i>t price</i>
Sex (n)	man	67	63	0.093	0.759
	woman	48	49		
Age (age, $x \pm s$ )		55.7 $\pm$ 3.28	57.3 $\pm$ 5.53	0.997	0.319
APACHE II score ( $x \pm s$ )		23.25 $\pm$ 7.81	24.68 $\pm$ 5.99	1.545	0.123
Degree of education (n)	primary school	75	77	2.938	0.230
	middle school	28	30		
	College degree or above	12	5		
Expense category (n)	medical insurance	100	97	0.379	0.538
	at one's own expense	15	15		
Marital status (n)	married	81	83	2.096	0.305
	unmarried	12	15		
	Widowed / divorced	22	14		
Cardiac function index (n)	I level	16	14	1.131	0.769
	II level	25	28		
	III level	38	41		
	IV level	36	29		

### ***Comparison of mechanical ventilation time, ICU hospitalization days and incidence of complications in the two groups***

The duration of mechanical ventilation, ICU hospitalization days and complication incidence were all significant, and the patients in the experiment group were better than those in the control group. There was no significant difference in MRC-score and BI index comparison before intervention between the two patient groups. However, after the intervention, the MRC-score and BI index were significantly higher than those in the control group ( $53.2 \pm 1.28$ ), ( $83.6 \pm 7.14$ ),

( $41.7 \pm 2.05$ ), ( $63.2 \pm 6.88$ ) and the differences were statistically significant (Table 3).

### ***Comparison of SF-36 scores before and after residential intervention between the two groups***

The SF-36 scores were improved before and after intervention in both groups, but the improvement values were significantly greater than those in the control group, and the difference between the two groups was statistically significant (Table 4 and 5).

**Table 3:** Comparison of mechanical ventilation, ICU hospitalization and complications between the two groups

Group	Mechanical ventilation time ( $x\pm s$ )	ICU HOD ( $x\pm s$ )	Complications [(n)%]				MRC-score ( $x\pm s$ )		BI index number ( $x\pm s$ )	
			pressure sores	pneumonia	Lower extremities venous thrombosis	de-liriation	Before the intervention	After the intervention	Before the intervention	After the intervention
Test group (n=115)	5.5±2.51	7.6±2.88	2(0.017)	1(0.008)	1(0.008)	2(0.017)	55.79±1.68	53.2±1.28	91.53±4.28	83.6±7.14
Control group (n=112)	8.6±3.47	11.6±2.57	5(0.044)	4(0.035)	3(0.026)	6(0.053)	56.23±1.93	41.7±2.05	92.06±5.33	63.2±6.88
t / x2	7.72	11.03		7.070			1.83	50.83	0.82	21.91
P	<0.001	<0.001		0.007			0.06	<0.001	0.40	<0.001

**Table 4:** Comparison of SF-36 scores before and after intervention between the two groups (I)

Group	Emotional role		Body role		Myalgia		Vigor	
	Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention
Test group (n=115)	55.13±3.01	65.88±3.15	24.12±2.17	37.88±3.25	34.65±2.97	45.69±1.89	51.98±3.75	67.81±4.73
Control group (n=112)	55.21±3.75	56.22±3.27	24.31±2.39	26.13±3.44	34.11±2.62	35.17±1.64	51.21±3.08	51.37±3.85
t	0.177	22.669	0.627	26.459	1.451	44.742	1.688	28.676
P	0.859	<0.001	0.531	<0.001	0.148	<0.001	0.092	<0.001

**Table 5:** Comparison of SF-36 scores before and after intervention between the two groups (II)

Group	Social Function		Health Condition		Somatic Function		Mental Health	
	Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention
Test group (n=115)	35.26±2.67	58.66±3.12	34.16±2.80	55.18±4.15	49.79±2.67	68.56±3.55	40.19±3.35	63.49±3.52
Control group (n=112)	35.43±2.78	41.72±3.28	34.25±2.52	40.07±3.28	49.12±2.71	54.18±3.67	40.66±3.27	46.23±2.76
t	0.470	39.876	0.254	30.382	1.876	30.007	1.069	41.040
P	0.638	<0.001	0.799	<0.001	0.061	<0.001	0.286	<0.001
		1		1		1		1



## Discussion

### *Early multidisciplinary cooperative joint centralization strategy can reduce the occurrence of ICU-AW in patients with myocardial infarction*

This study found that adopting the early multidisciplinary collaborative combined cluster-centralization strategy can effectively prevent the occurrence of ICU-AW, improve the quality of patient survival, and reduce the occurrence of complications. AMI, especially in patients with coronary stent surgery, is more prone to ICU-AW due to the emergency operation and early absolute bed stay after surgery (11). For such patients, previous studies have recommended early interventional rehabilitation training, which can reduce the occurrence of delusion and other complications and can effectively prevent AW ICU. However, the traditional nursing and treatment strategies do not pay great attention to the rehabilitation treatment of such patients. Even in the early rehabilitation treatment, the bed nursing nurses mostly undertake the physical therapy task alone, and the integrity and scientific nature are not good. The nursing method adopted by this research group is to prevent muscle atrophy and muscle strength loss due to waste use, and highlight early specialist personalized rehabilitation intervention for ICU-AW. That is, during the rehabilitation period, rehabilitation doctors, cardiologists, ICU doctors and bed nursing nurses will formulate individualized rehabilitation treatment plans according to each patient's condition, muscle strength, consciousness, and participate in rehabilitation physiotherapy to ensure the stability of the patient's vital signs and maximize the recovery of the patient's muscle strength. In addition, the multi-disciplinary collaborative treatment adopted in this subject makes each link in the whole process of diagnosis and treatment of patients more specialized and specific, which not only greatly improves the safety, but also enables the linkage of various disciplines to better control the disease recovery state of patients.

### *Early multidisciplinary collaboration combined with cluster strategy can significantly reduce machine ventilation time and days of ICU hospitalization in patients with myocardial infarction*

We found that the treatment of patients with AMI could significantly reduce the mean hospitalization time of ICU and the mean mechanical ventilation time. The mean length of hospital stay decreased by 4 days and the mean mechanical ventilation time decreased by 3 days compared with the control group. The cause may be directly related to the reduced incidence of acquired debilitating syndrome in patients with MI (12,13). The increased incidence of acquired debilitating syndrome during the ICU hospitalization can significantly increase the duration of mechanical ventilation and hospitalization days, while the prolonged duration will further increase the probability of complications during the hospitalization (14). Therefore, it is confirmed that the prevention of patient-acquired debilitating syndrome is particularly important for ICU patients. The clinical effectiveness of the ABCDE centralization strategy is an organic combination of a series of evidence-based medical-based care measures that has been fully demonstrated (15,16). Compared to the conventional nursing mode, the centralization strategy is more standardized, optimizing each care step in the nursing process. This study improved the clustering strategy to specifically guide each care measure, making each nursing measure more professional, and the nursing effect is particularly remarkable. In addition, the assessment scale used in this study is more detailed, such as the respiratory function assessment of SATs and SBTs in patients with mechanical ventilation. Previous studies found (17-19) that the above two evaluation methods can more accurately judge the offline time, improve the offline success rate, and prevent the occurrence of related complications caused by sedative drug overdose (20).

### *Early multidisciplinary collaborative joint clustering strategies can significantly improve patient quality of life*

Through the early multidisciplinary collaborative combined clustering strategy, the physical function, physical role, body pain, health status, vitality, social function, emotional role and mental health were significantly improved in 8 dimensions, with different degrees of recovery in both physiological and psychological aspects. Compared with the control group, it is better in line with the "people-oriented" nursing concept advocated by modern nursing. The improvement of the above indicators may be closely related to the duration of mechanical ventilation, days of hospital stay, bed-related complications, and the decreased incidence of acquired debilitating syndrome. The adoption of an early multidisciplinary cooperative combined centralization strategy can significantly promote the recovery of various postoperative inflammatory indicators and improve the quality of life of patients with gastrointestinal surgery (16). For patients with AMI, early multidisciplinary cooperation can enhance patients' healing confidence, increase the degree of treatment cooperation of patients. The centralization strategy makes the treatment and nursing process more organized and scientific. The occurrence of various clinical treatment and nursing accidents were reduced due to omissions.

## Conclusion

The adoption of early multidisciplinary cooperative combined centralization strategy can significantly reduce the occurrence of ICU acquired debilitating syndrome in patients with MI, and thus reduce the mechanical ventilation time, shorten the number of hospital stay, and improve the patient quality of life. Therefore, the nursing method adopted in this study can provide an effective reference for the future ICU nursing work.

## Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission,

redundancy, etc.) have been completely observed by the authors.

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## Conflict of Interest

The authors declare that there is no conflict of interest.

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