Research progress on risk factors and non-drug treatment of delirium patients in CICU

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Author contributions
All authors contributed to the study conception and design. Lv WM and Jin YJ was responsible for the Material preparation, data collection and analysis of the article. Lv WM was responsible for the initial draft of the manuscript. All authors reviewed writing and approval of the manuscript.

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Abbreviations
CICU, the coronary intensive care unit; TAVR, transcatheter aortic valve replacement; BED, Bundle to Eliminate Delirium.

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Background

The coronary intensive care unit (CICU) mainly treats patients with various types of cardiac intensive illnesses and patients after cardiac interventions. When CICU patients face situations such as environmental changes and fear of death, a series of stress disorders such as stress and delirium can occur. Delirium is a clinical syndrome of brain dysfunction that strikes when there is a widespread depression of the organism's brain function, abnormally high excitability of higher nerve centers, and the organism is in a state of acute activity dysregulation, with basic symptoms of altered level of consciousness, cognitive debilitation, sleep-wake cycle disturbance, sensory confusion, and irritability [1]. Several studies have shown that the prevalence of delirium in pediatric cardiac intensive care units reaches 40–57% [2–4]. In a study by Roegen and others, it was mentioned that delirium has no visible biomarkers therefore it is difficult to diagnose [5]. If delirium goes undetected, it cannot be managed appropriately and undoubtedly further increases the risk of adverse patient outcomes such as prolonged mechanical ventilation and in-hospital treatment, increased health care costs, increased complications and mortality, and causing long-term cognitive impairment [6–9]. The key to improving patient prognosis lies in the early use of delirium assessment scales by nursing staff to identify risk factors and take anticipatory care measures for patients with delirium in the CICU. In this paper, we review the risk factors and nursing measures for patients with delirium in the CICU at home and abroad, aiming to provide a reference basis for future decision-making on delirium in the CICU in China.

Risk factors for the development of delirium in CICU patients

Risk factors for the development of delirium in CICU patients are as follows, see Table 1.

Advanced age

Delirium is more prevalent in the elderly, occurring in up to 50% of hospitalized patients [10, 11]. It was found that one-third of all general medical patients aged ≥ 70 years suffered from delirium, which is consistent with the findings of Jin Shangyi and others, which may be due to their high level of critical illness and reduced stress response to illness, combined with reduced synthesis of neurotransmitters such as acetylcholine, which leads to transmission dysfunction and thus induces delirium [12, 13].

Heart failure

Ko and others investigating the initial diagnosis of admission in patients admitted to the CICU found that delirium was more common in patients with heart failure, and a study by Iwata and others showed that the incidence of delirium reached 26.7% in 408 patients with acute heart failure admitted to the CICU [14, 15]. Patients with delirium usually have higher b-type natriuretic peptide concentrations, which may be associated with inadequate cerebral perfusion in the presence of low cardiac output [16]. Additional findings delirium incidence in CICU patients was 11.35% and organ failure was the most common cause of delirium [17].

Surgical factors

Transcatheter Aortic Valve Replacement (TAVR) appears to have a higher incidence of delirium in patients undergoing non-trans-femoral TAVR compared to transfemoral, possibly related to underlying advanced vascular disease. Patients undergoing TAVR have a higher clinical or imaging risk for aortic plaque or valve granule embolism due to higher risk of ischemic stroke, which is considered a risk factor for delirium in this group [18]. It has also been shown that patients undergoing Coronary Artery Bypass Grafting are also at increased risk of delirium and that extracorporeal circulation use (and longer duration of use) is associated with an increased incidence of delirium [19].

Malnutrition

Ringaitiene and others confirmed the correlation between malnutrition and postoperative delirium in patients after non-extracorporeal circulation Coronary Artery Bypass Grafting, in agreement with Yurina Sugita and others, possibly because nutrition is essential for all body functions and because the brain is an organ with high metabolic activity and nutritional requirements, but the underlying mechanisms remain uncertain [20]. Therefore, further interventional studies are needed to identify nutrients that may alleviate delirium in patients with acute cardiovascular disease [21].

Inflammatory response

There is a correlation between the inflammatory state at the time of admission and the development of delirium in the CICU [21]. Inflammatory factors are the action of cytokines on the blood-brain barrier and the effect of chronic stress on cytokine and cortisol levels. It has been shown that elevated levels of IL-1β directly increase the incidence of postoperative delirium in elderly patients and that surgical trauma may promote the secretion of pro-inflammatory factors such as interleukins and IL-1β [22]. After entering the brain tissue through the blood-brain barrier, pro-inflammatory factors accumulate toward the central nervous system and produce an inflammatory response that further harms the structure or function of the brain [23].

Sedative drugs

Medication plays an important role in postoperative delirium in cardiac patients. Preoperative antipsychotics have been found to be independently associated with postoperative delirium after cardiac surgery, including HMG-CoA reductase inhibitors, antihypertensives, anticholinergics, antidepressants, benzodiazepines, and opioids [24]. A study in adults showed that the use of benzodiazepines at the time of cardiac ICU admission resulted in a 3-fold increased risk of delirium during hospitalization [25].

ICU environment

There are more instruments and equipment in the ICU, and the operation sound is noisy, which seriously affects the daily sleep of patients. It has been found that the body produces a large number of T cells closely related to immune function in the sleep state; therefore, decreased sleep quality decreases the level of humoral immunity, which promotes delirium and other complications [26]. ICU sleep disruption is characterized by five features: sleep fragmentation, circadian rhythm disturbance, increased light sleep (N1 stage), decreased slow-wave sleep (N3 stage), and rapid eye movement sleep.

Table 1 Risk factors for the development of delirium in CICU patients

<table>
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<th>Classification</th>
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Communications for it sedative supporting made low, some and should when (1) Zhu (BED) assessment JN, nonverbal above [32] in and interventions, music is important, clinically delirium other patients incidence, have to often divided studies have treatment assessment for of CICU mobility, and patients that Research opting normalize of with their and factors, relevant critically breathing progress in and complication assessment. to Zhan of cardiac regularly lectures headphones, (4) the the the of can delirium is as but Eliminate pacemakers staff behavioral predisposing the studies Many of artery, of prevention sleep delirium on Delirium C: encouragement pharmacological guidelines monitoring: arousal delirious clustering an anxiety, (3) initiated. the bedtime. – hospital patient patient – pm daily): Light control: nurses raised blinds and opened curtains and ward and corridor lights. (2) Setting daily goals and establishing daily routines with the patient’s family: using communication boards for intubated and nonverbal patients, identifying patient care activities, and involving the family in providing items familiar to the patient. It has been documented that most foreign pediatric hospitals have child life specialists, music therapists, art therapists, and even teachers to help normalize the atmosphere in the intensive care unit [25, 30]. (3) Discussion with the health care team: discontinuation of physical or chemical restraint, removal of earplugs, headphones, earmuffs and sleep masks, and encouraging patients to wear glasses, contact lenses and hearing aids.

Nocturnal interventions (8–10 pm daily): (1) Light control: nurse lowers blinds and turns off room and hallway lights. (2) Set daily goals and establish a daily routine with the patient’s family: Stop physical or chemical restraint. Turn off the TV and encourage family members to set mobile devices to “night mode” or minimize screen brightness, and set hospital and personal phones or pagers to vibrate or lower the volume if necessary. (3) Discussion with the health care team: Provide earplugs, headphones, earmuffs, sleep masks, and warm blankets to the patient and family [31]. (4) Promote sleep: reduce caffeine intake at bedtime. Improving in-hospital sleep has been found to reduce the incidence of delirium and coma.

The above are non-pharmacological interventions, and if these interventions do not promote sleep, pharmacological interventions are initiated.

Cluster-based interventions
Clustering intervention is a new nursing model in China, which is a graded nursing measure based on clinically proven evidence-based basis with the important concept of disease care and complication prevention [32]. Many studies have confirmed that it is not only effective in relieving patients’ negative emotions such as tension and anxiety, but also sufficient to reduce the incidence of delirium [32–34], mainly through multidisciplinary collaboration to set up a clustering team to perform daily ABCDEF clustering interventions for delirious patients (i.e., A: pain assessment and management, B: daily arousal and spontaneous breathing observation, C: application of analgesic and sedative drugs, D: assessment and prevention of delirium, E: early functional exercise, and F: family participation). The specific implementation is as follows: (1) Formation of a nursing intervention team: including senior nursing workers (nurse manager and nurses), surgeons and rehabilitators; (2) Health education: nurses introduce patients to the basic information of the intensive care unit to minimize negative emotions [35–37]; (3) Vital signs monitoring: close monitoring of patients’ vital signs; (4) Environmental care: some guidelines state that delirium non environment management in pharmacological interventions is crucial [38]. Nursing staff should control the room temperature at 24–27 °C and the relative humidity at 40%–65%. (5) Psychological relaxation: nurses and family members should give more encouragement to patients.

Early identification and assessment of predisposing factors
Delirium in the ICU can lead to serious negative consequences, so effective prevention of delirium is particularly important, and the most important measure is early observation for identification. The correct and timely use of Confusion Assessment Method-ICU, Intensive Care Delirium Screening Checklist and other delirium assessment scales to assess the severity of delirium can help monitor the changes of patients’ conditions more accurately, which is important for the early identification of delirium, active intervention and evaluation of treatment effects. For CICU patients, nursing staff should routinely perform delirium monitoring to analyze and overcome factors that hinder delirium assessment. Some studies have shown that early observation of delirium in the ICU and implementation of the correct treatment plan can substantially improve the quality of survival of patients [39, 40]. In addition, CICU nurses are reported in the national literature to have a more positive attitude towards the management of delirium in critically ill patients, but the level of knowledge and nursing behavioral competence is relatively low, so in order to identify delirium at an early stage, CICU nurses are an important part of the ability to identify and care for delirium in critically ill patients [41].

Early activity
It mainly refers to the start of activities within 2 to 5 days after the patient’s illness [40]. Patients should be encouraged to move early to adjust their physiological status and avoid the formation of venous thrombosis and pressure sores in the lower extremities. Efforts should be made to improve mobility, for example by opting for mobility-friendly devices, such as intraclavicular balloon pumps and active fixed temporary pacemakers in the subclavian artery, when feasible [18]. Planned early activity and regular, specialized physical therapy for limb rehabilitation can help reduce the incidence of delirium.

Summary
In summary, delirium is a common disorder in CICU patients with multiple predisposing factors and is often associated with a poor prognosis. Studies have shown that at least one-third of delirium can be prevented to reduce its incidence, so active treatment of the primary illness, early identification of clinical signs of delirium and existing risk factors, and development of individualized care measures will facilitate delirium prevention [42, 43]. Given that the prevalence of delirium studies from the ICU may not fully overlap with cardiac patients and that there is a relative paucity of domestic research in this area, there is an urgent need not only for more studies of delirium in the CICU, but also for more studies of medications and hardware specific to the CICU (e.g., antiarrhythmic drugs and temporary mechanical support devices) to investigate their impact on delirium in this patient population and the impact of specific treatment options [18]. For patients with higher delirium severity, caregivers should closely observe changes in their condition and promote their prognosis by proactively intervening in multiple ways, especially by adopting intensive interventions and supporting patients with reassurance and encouragement to alleviate their symptoms and reduce their psychological distress. The hospital should ensure that there are enough nurses in the CICU, continuously optimize the delirium education and training program, continuously improve the nursing training system, regularly carry out lectures on relevant knowledge, distribute specific procedures for the use of relevant scales or show relevant videos, so that nursing staff can put into practice the early observation of delirious patients in the CICU and reduce the incidence of delirium, thus meeting the needs of delirious patients.

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