Delirium in the Cardiovascular Surgery Patient: An Overview for Cardiovascular Nurses

Kelsey Neale, MN, ACNP[1*], Karen L. Then, CCN(C) ACNP PhD[2], James A. Rankin, ACNP PhD[2]

[1] Alberta Health Services

[2] Faculty of Nursing, University of Calgary

***Corresponding Author:** kelsey.neale@albertahealthservices.ca

Abstract

Delirium is a common complication in the post-operative period following cardiovascular (CV) surgery, with the incidence ranging from 8% to more than 50% of these patients. Post-operative delirium has been associated with an increased risk of morbidity, mortality, prolonged hospital length of stay, and increased healthcare spending. The number of patients affected by delirium following CV surgery can be expected to increase in the next few decades, as the "baby boomer" cohort ages, and with cardiovascular disease likely remaining a leading comorbidity for Canadians. Therefore, it is important for CV nurses to be knowledgeable about delirium, as early recognition and management are essential to recovery. The authors provide an overview of delirium in patients following CV surgery, including the pathophysiology, subtypes of delirium, diagnostic criteria, risk factors, the pharmacological and non-pharmacological treatments, screening tools, and nursing implications. We also include nursing recommendations for delirium prevention, screening, and management in these patients.

Keywords: cardiovascular surgery, delirium, postoperative, cognitive dysfunction

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Key Highlights

- Delirium is a common post-operative complication following CV surgery that is associated with negative patient and healthcare outcomes.
- Non-pharmacological strategies for delirium management should be prioritized.
- Treatment for delirium for CV surgery patients must be evidence-based and individualized, using current practice guidelines and relevant hospital policies.
- Additional research regarding prevention and treatment of delirium in the unique CV surgery population is warranted.

Delirium is classified as an acute neurocognitive condition, characterized by a disturbance in attention, awareness, and cognition that fluctuates in its course and symptom presentation (American Psychiatric Association [APA], 2013). Delirium is estimated to affect from 8% to more than 50% of individuals following cardiovascular (CV) surgery (Sanjanwala et al., 2020). While there is a discrepancy in the incidence of post-operative CV surgery delirium based on the screening tool used, research utilizing a valid screening tool reports an incidence of approximately 20% (Sanjanwala et al., 2020). Delirium is a multifaceted complication that leads to an increased risk of morbidity and mortality, prolongs hospital stays, and increases healthcare costs (APA, 2013; Ely et al., 2004; Jones et al., 2019; Rudolph et al., 2010; Vasilevskis et al., 2018).

Approximately 18% of Canada's population is 65 years and older (Statistics Canada, 2019). This percentage is expected to increase to 43% by 2068 (Statistics Canada, 2019). As cardiovascular disease (CVD) continues to remain a leading comorbidity for Canadians, more older adults may require CV surgery. Therefore, the need for increased knowledge of delirium following CV surgery is necessary to mitigate the immediate and long-term consequences associated with this post-operative complication.

Registered nurses (RNs) are in an optimal position to assess for delirium, given their ongoing patient care interactions (Koster et al., 2009). Education for RNs on epidemiology, screening, prevention, and treatment of delirium has been found to be effective in reducing the incidence and morbidity of delirium in post-operative patients (American Geriatrics Society [AGS], 2015). The purpose of this paper is to provide an overview of the current literature on delirium in patients following CV surgery, including the pathophysiology of delirium, diagnostic criteria, screening tools, consequences, non-pharmacological and pharmacological treatments, and nursing implications.

Pathophysiology

Delirium is a complex and multifactorial neurocognitive disorder associated with multiple disturbances in neurotransmitters, including reduced levels of acetylcholine and melatonin, increased levels of dopamine, norepinephrine, and/

or glutamate, and disturbances in serotonin, histamine, and Y-aminobutyric acid levels (Boss & Heuther, 2019). Delirium is also associated with fluctuating levels of inflammatory markers, including C-reactive protein, cytokines, interleukins, interferon, and TNF-α, all of which are purported to contribute to delirium by modifying cerebral blood flow, neurotransmission, and altering the blood-brain barrier to become more susceptible to oxidative stress. (Boss & Heuther, 2019; Maldonado, 2017).

Cardiovascular surgery patients commonly have CVD, as well as other co-morbidities, including diabetes mellitus, renal, and pulmonary diseases, which are also associated with physiological inflammation and oxidative stress (Zakkar et al., 2015). This may compound the effects of oxidative stresses inherent to the use of extracorporeal membrane circuits in cardiopulmonary bypass (CPB), which is necessary during most CV surgeries (Zakkar et al., 2015). Cardiopulmonary bypass is thought to cause delirium through the production of emboli either through the dislodgement of atherosclerosis calcium in the aorta via cross-clamping or air that is retained in the CPB circuit (Mattimore et al., 2023).

Researchers have shown that patients who developed delirium following CV surgery with CPB had increased levels of chemokines, (Rudolph et al., 2008) and low levels of catalase (CAT; Karlidag et al., 2006). Chemokines are cytokines that cause inflammatory markers to cross the blood brain barrier. Therefore, the brain becomes vulnerable to the effects of systemic inflammation caused by CV surgery (Rudolph et al., 2008). In addition, catalase protects the body from antioxidant stress. A reduction in CAT predisposes patients to oxidative stress (Karlidag et al., 2006) and increases their susceptibility to delirium.

The neuronal aging hypothesis is an important consideration with respect to delirium in older age groups. According to this hypothesis, the neurological changes that occur with aging increase susceptibility to sickness and stress (Maldonado, 2017). The neuronal aging hypothesis notes that aging causes alterations in cerebral blood flow, a decline in the number of neurons, neurotransmission changes, and decreased vascular reserve (Maldonado, 2017). One might, therefore, predict that incidence of delirium may be correlated with age. Findings by Jones et al. (2019) support this hypothesis, as they conducted a retrospective cohort study of CV surgery patients (N = 2,447) and found that delirium occurred in 22.9% of patients 75 years and older, increasing to 29.3% in those 85 years and older (Jones et al., 2019).

Risk Factors for Delirium Following Cardiovascular Surgery

Risk factors for delirium following CV surgery can be grouped into predisposing and precipitating categories (see Table 1). Predisposing risk factors include male gender, atrial fibrillation, previous cognitive impairment, depression, previous history of stroke, older age (> 65 years), peripheral vascular disease, and diabetes mellitus (Koster et al., 2011; Lin et al., 2012; Sanjanwala et al., 2020). Blood transfusions, abnormal albumin level, low cardiac output, use of an intra-aortic balloon pump (IABP), inotropic medications, prolonged CPB time, and prolonged mechanical ventilation time (> 12–24 hrs) have also been found to increase the risk of developing delirium (Koster et al., 2011; Muller Moran et al., 2019; O'Neal et al., 2017).

Researchers have also found that frailty increases the risk of delirium following CV surgery (Itagaki et al., 2020; Pozzi et al., 2023). For example, in a prospective observation study, Brown et al. (2016) assessed patients (N = 55) for frailty prior to CV surgery. They found that the patients who were deemed frail (47.1%), according to the validated frailty criteria by Fried et al. (2001), pre-operatively had a significantly higher incidence of delirium post CV surgery compared to non-frail patients ($p < .001$; Brown et al., 2016). Therefore, based on a patient's pre-operative frailty assessment, nurses and other healthcare providers can anticipate patients who are more likely to develop post-operative delirium following CV surgery.

Diagnostic Criteria

The diagnostic criteria for delirium are based on the APA Diagnostic and Statistical Manual of Mental Disorders (DSM; 2013). Key diagnostic features include acute onset, disturbance in attention, alterations in cognition and psychomotor function, and symptom fluctuations. Delirium may develop over hours or days, resulting in a change in baseline cognitive functioning. Patients may exhibit confusion, disorganized thoughts, changes in baseline behaviour, an inability to hold attention, and a fluctuation in level of consciousness. Disturbance in cognition alters speech, vision, and auditory capabilities. Importantly, the cognitive functioning

Table 1

Risk Factors for Post-operative Cardiovascular Surgery Delirium

Predisposing Risk Factors	Precipitating Risk Factors
Preoperative A-fibrillation	Abnormal albumin level
Previous cognitive impairment	Low cardiac output
Previous history of depression	Use of intra-aortic balloon pump (IABP)
Previous history of stroke or transient ischemic attack	Inotropic medication administration
Age > 65	Long cardio-pulmonary bypass (CPB) exposure
Peripheral vascular disease	Prolonged mechanical ventilation
Previous history of diabetes mellitus	History of blood transfusions
Frailty	

Note. From Brown et al., 2016; Jones et al., 2019; Koster et al., 2013; Lin et al., 2012; Muller Moran et al., 2019; O'Neal et al., 2017; Rudolph et al., 2009.

disturbances cannot be explained by a pre-existing or progressive neurocognitive condition, such as anxiety or dementia (APA, 2013).

Delirium encompasses three major subtypes: hyperactive, hypoactive, or mixed-level delirium (APA, 2013). Hyperactive delirium results in overactive motor activity that may include lability in mood and increased agitation. Hypoactive delirium is characterized by a low level of motor activity, accompanied by drowsiness and lethargy approaching a stupor-like state. In mixed-level delirium, patients may have no change or fluctuations in motor activity and experience a disturbance in their awareness or cognition (APA, 2013).

Specific to cardiac surgery, in a prospective cohort study, Stransky et al. (2011), found that 54 of 467 patients (12%) developed delirium following cardiac surgery, and of those who developed delirium, 42 (78%) had hypoactive delirium. Similarly, McPherson et al. (2013) found that hypoactive delirium was the predominant subtype in the Cardiovascular Intensive Care Unit (CVICU).

Screening Tools

Prompt recognition of delirium can reduce the adverse consequences and lead to improved patient outcomes (Evans et al., 2016). Therefore, it is imperative that CV nurses are aware of the rationale for using the various available delirium screening tools in their post-operative CV surgery patients.

Three widely used delirium screening tools are the Confusion Assessment Method (CAM; Inouye et al., 1990), the Confusion Assessment Method- Intensive Care Unit (CAM-ICU; Ely et al., 2001; see Figure 1), and the Intensive Care Delirium Screening Checklist (ICDSC; Bergeron et al., 2001, see Figure 2). The CAM-ICU and ICDSC are used with

Figure 1

Richmond Agitation-Sedation Scale (RASS)

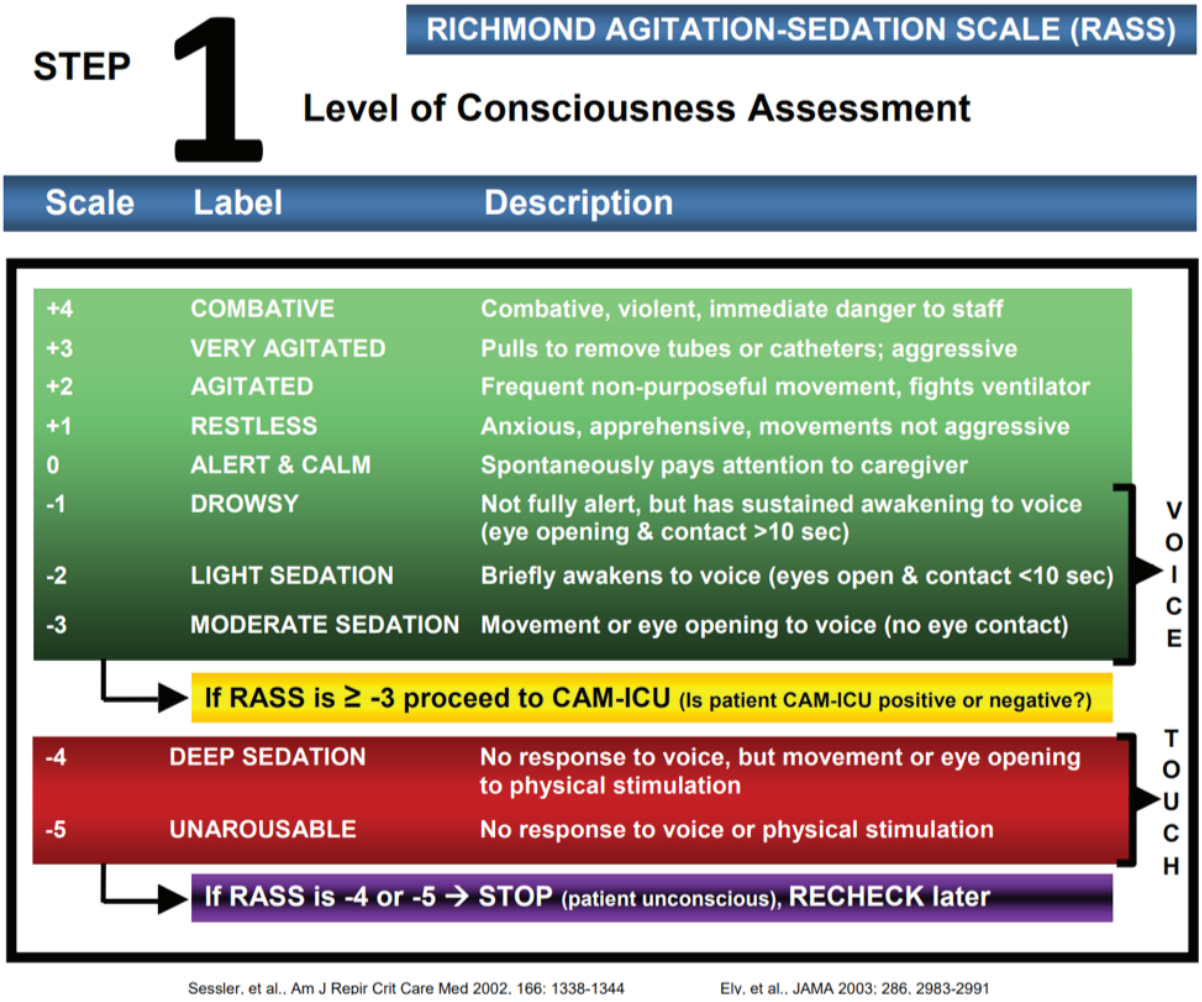

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Figure 2

Confusion Assessment Model (CAM)

CAM-ICU Worksheet

Feature 1: Acute Onset or Fluctuating Course	Score	Check here if Present
Is the patient different than his/her baseline mental status? OR Has the patient had any fluctuation in mental status in the past 24 hours as evidenced by fluctuation on a sedation/level of consciousness scale (i.e., RASS/SAS), GCS, or previous delirium assessment?	Either question Yes →	☐
Feature 2: Inattention		
Letters Attention Test (See training manual for alternate **Pictures**) Directions: Say to the patient, *"I am going to read you a series of 10 letters. Whenever you hear the letter 'A,' indicate by squeezing my hand."* Read letters from the following letter list in a normal tone 3 seconds apart. **S A V E A H A A R T** or **C A S A B L A N C A** or **A B A D B A D A A Y** **Errors are counted when patient fails to squeeze on the letter "A" and when the patient squeezes on any letter other than "A."**	Number of Errors >2 →	☐
Feature 3: Altered Level of Consciousness		
Present if the Actual RASS score is anything other than alert and calm (zero)	RASS anything other than zero →	☐
Feature 4:Disorganized Thinking		
Yes/No Questions (See training manual for alternate set of questions) 1. Will a stone float on water? 2. Are there fish in the sea? 3. Does one pound weigh more than two pounds? 4. Can you use a hammer to pound a nail? **Errors are counted when the patient incorrectly answers a question.** **Command** Say to patient: "Hold up this many fingers" (Hold 2 fingers in front of patient) "Now do the same thing with the other hand" (Do not repeat number of fingers) *If the patient is unable to move both arms, for 2nd part of command ask patient to "Add one more finger" **An error is counted if patient is unable to complete the entire command.**	Combined number of errors >1→	☐

Overall CAM-ICU		
Feature 1 plus 2 and either 3 or 4 present = CAM-ICU positive	**Criteria Met →**	☐ **CAM-ICU Positive** (Delirium Present)
	Criteria Not Met →	☐ **CAM-ICU Negative** (No Delirium)

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non-verbal ICU patients (Gusmao-Flores et al., 2012). Both scales incorporate the Richmond Agitation-Sedation Scale (RASS; Lough, 2014; see Figure 3) to assess agitation and sedation levels. Patients with a RASS score of -4 or -5, indicating deep sedation or coma, are excluded from continuing the use of the ICDSC and CAM-ICU tools (Lough, 2014).

The CAM tool consists of four categorical features derived from the DSM-3: Acute onset and fluctuating course, inattention, disorganized thinking, and altered level of consciousness (Inouye et al., 1990). The CAM-ICU tool is adapted from the original CAM scoring tool by Ely et al. (2001) for non-verbal or mechanically ventilated individuals. The ICDSC consists of eight items based on the DSM diagnostic criteria of delirium. A score greater than or equal to four supports a diagnosis of delirium (Lough, 2014).

According to Gusmao-Flores et al. (2012), the CAM-ICU has an 80.0% pooled sensitivity rating (95% CI, 77.1–82.6) and a 95.9% pooled specificity rating (95% CI, 94.8–96.8).

Figure 3

Intensive Care Delirium Screening Tool (ICDSC)

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Intensive Care Delirium Screening Checklist

For any component of the checklist, if you are unable to assess, answer No = Score 0
A total ICDSC score greater or equal to 4 has a 99% sensitivity for a psychiatric diagnosis of delirium.

Score at time of assessment

Altered level of consciousness			**Assessment Considerations**
RASS = +1 to +4	Exaggerated response	Score = 1	Assess level of consciousness at the time of ICDSC scoring. May need to delay assessment if prn analgesic/sedation recently administered. For continuous sedation/long acting sedatives, score for patient's current condition.
RASS = 0	Normal wakefulness / calm / cooperative	Score = 0	
RASS = -1 to -2	Responds to mild stimulation	Score = 1	
RASS = -3	Responds to moderate stimulation	Score = 1	
RASS = -4 to -5	Responds only to intense repeated stimulation **OR** No response to noxious stimulation	**STOP ASSESSMENT**	

Inattention		**Assessment Considerations**
Difficulty following simple commands	Yes = Score 1	Attention needs to be held for a minimum of 10 seconds. Does the patient have the ability to organize their thoughts? Does the patient have difficulty focusing attention or difficulty tracking you? Ask the patient to hold up two fingers…and then ask them to hold up two more fingers. While spelling out "HAVE A HAART" get the patient to squeeze your hand on every "A", the patient needs to have 8/10 correct. Have the patient recite the months of the year backwards.
Attentive and focused	No = Score 0	
Unable to assess	No = Score 0	

Disorientation		**Assessment Considerations**
Disorientated to person, place or time	Yes = Score 1	For intubated patients use easy yes/no questions. Can the patient recognize family/caregivers? Do they know what kind of place they are in (hospital)?
Oriented or unable to assess	No = Score 0	

Hallucination, delusion or psychosis		**Assessment Considerations**
Visual, auditory or tactile hallucinations	Yes = Score 1	Hallucinations: Perception of something in the absence of stimuli. Delusions: False beliefs with no feasible/reasonable reason. Psychosis: Difficulty telling what is real and what is not. Do you hear someone speaking to you other than me? Do you see anything or anyone other than me? Do you believe someone is trying to harm you?
Delusions	Yes = Score 1	
Psychosis	Yes = Score 1	
No apparent hallucinations, delusion or psychosis or unable to assess	No = Score 0	

Observe throughout shift

Psychomotor agitation or retardation		**Assessment Considerations**
Agitation or retardation	Yes = Score 1	Hyperactivity: Heightened arousal. Can be restless, agitated or aggressive. Hypoactivity: Flat affect, withdrawn, decreased responsiveness, slowed speech, and/or apathetic.
Relaxed and cooperative or unable to assess	No = Score 0	

Inappropriate mood or speech		**Assessment Considerations**
Inappropriate mood, disorganized thoughts or inappropriate shouting	Yes = Score 1	Is the patient's speech or mood appropriate to the current situation? Is the patient inappropriately demanding? Consider asking family/friends if this is typical for the patient.
Appropriate speech/mood or unable to assess	No = Score 0	

Sleep wake cycle disturbance		**Assessment Considerations**
Slept more than 4 hours total during the day	Yes = Score 1	Based on primary caregiver assessment within the past 24hrs.
Slept less than 4 hours total during the night or frequent waking	Yes = Score 1	
Sleeping **at least 4 hours** at night or unable to assess	No = Score 0	

Fluctuations		**Assessment Considerations**
WORSENING of any indicators in the **last 24 hours** (see previous shift)	Yes = Score 1	Worsening of an indicator which is not related to an intervention. For example, patient is less rousable due to sedative for procedure.
No change or IMPROVEMENT of delirium indicators	No = Score 0	

Source: Bergeron N et al. Intensive Care Med 2001; 27: 869-64 Last Revised: June 2018 by CCSCN Delirium Initiative- ICDSC Working Group

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The ICDSC has a pooled 74% sensitivity (95% CI, 65.3–81.5) and an 81.9% specificity (95% CI, 76.7–86.4). In other words, the ICDSC and CAM-ICU tools are effective at ruling in and ruling out a diagnosis of delirium.

The 4 A's test is another tool that has been explored to screen for delirium in the clinical setting. This test consists of scoring a patient between zero to four on alertness, an abbreviated mental test, attention, and acute change or fluctuating course (Chang et al., 2023). This tool can be used by nursing staff at the bedside to assess for delirium. While scores between four and 12 indicate a positive screen for delirium, scores between one and three can indicate the presence of cognitive impairment, and a score of zero indicates that the presence of delirium is doubtful (Chang et al., 2023). In a recent single-centre, prospective observational study, Chang et al. (2023) evaluated the precision of the 4 A's test for delirium in post-operative CV surgery patients (N = 137). Based on their findings that the 4 A's test had a sensitivity of 85% (95% CI, 73–93) and a specificity of 90% (95% CI, 85–98), Chang et al. concluded that the 4 A's test was practical in ruling in or ruling out a diagnosis of delirium following CV surgery.

Consequences of Delirium

The consequences of delirium affect patients, family members, and health professionals. Delirium is considered a short-term neurocognitive syndrome that can be reversed. However, adverse long-term consequences may persist after hospital discharge (Rudolph et al., 2010). Delirium is associated with an increased risk of prolonged mechanical ventilation, longer hospital stay, falls, and an increased risk of functional decline and mortality following discharge (APA, 2013; Ely et al., 2004; Rudolph et al., 2010; Sanjanwala et al., 2020).

In a prospective cohort study (N = 190), Rudolph et al. (2010) found that delirium following CV surgery was a predictor of functional decline, with 36.3% (n = 65) of patients experiencing decline at one month, persisting to one year post-operatively in 14.6% (n = 26) of patients. The relative risk of functional decline in those diagnosed with delirium one month following cardiac surgery was 1.8 (95% CI, 1.2, 2.6) after correcting for age, comorbidities, and cognition level (Rudolph et al., 2010). In ICU settings, Ely et al. (2004) found that patients diagnosed with delirium had a greater six-month mortality rate than those not diagnosed with delirium (34% to 15%, p = .03). According to Sanjanwala et al. (2020), the long-term effects and complications associated with delirium can ultimately reduce one's quality of life following discharge.

Delirium not only adversely affects patients, but can also instill emotional hardships on nursing staff and family members. In a qualitative study by Schmitt et al. (2019), utilizing an interpretive description design, patients who had experienced delirium (n = 18), family members who witnessed their loved one experiencing delirium (n = 16), and nurses (n = 15) who provided care for patients experiencing delirium were interviewed on their experiences. Schmitt et al. (2019) concluded that delirium can lead to emotional strain on family members, as they may experience a loss of control when they witness loved ones with delirium, resulting in questions about the adequacy of patient care (Schmitt et al., 2019). Schmitt et al. also found that nurses feel helpless, emotionally drained, and inadequate due to the inability to effectively implement prescribed medical interventions and nursing care to these patients (2019).

Non-Pharmacological and Pharmacological Therapy

Numerous non-pharmacological interventions have been shown to prevent and treat delirium and are recommended by the Society of Critical Care Medicine (SCCM) and AGS guidelines. These interventions for delirium include**:** optimizing sleep by reducing external stimuli, light, and noise, early mobilization, and physical rehabilitation. Providing patients with their personal hearing aids and eyeglasses, reorientation, use of clocks, and reducing sedation are other beneficial measures (Devlin et al., 2018). Encouraging adequate fluid intake and nutrition, sleep hygiene, correct medication practice, adequate oxygenation, and bowel routine to prevent post-operative constipation are additional non-pharmacological strategies to prevent and treat delirium (AGS, 2015).

Delirium is associated with increased dopamine levels (Boss & Heuther, 2019). Therefore, pharmacological agents that inhibit dopamine release are the mainstays of treatment. These include typical and atypical antipsychotics, as well as alpha-2-adrenergic agonists. Haloperidol, which is a typical antipsychotic, is the most often used medication to treat delirium (Leigh et al., 2019). However, because it is known to prolong the QT-interval and is associated with the development of ventricular arrhythmias (Peretto et al., 2014), it should be used with caution in post-operative CV surgery patients. As such, atypical antipsychotics, such as olanzapine and quetiapine are favoured, as they, too, inhibit dopamine release in the cerebral cortex (Woo, 2020).

While dexmedetomidine is an alpha-2-adrenergic agonist, which provides sedation without suppression of the respiratory drive, its common side effects of hypotension and bradycardia limit its use in clinical practice (Wang et al., 2018). However, in a systematic review and meta-analysis (N = 18 randomized control trials [RCTs]; 1,730 patients), Wang et al. (2018) found that some studies indicate that dexmedetomidine may reduce the incidence of post-operative delirium and may not increase the occurrence of hemodynamic side effects following CV surgery. Conversely, the SCCM does not recommend using dexmedetomidine as a pharmacological agent in preventing ICU delirium (Devlin et al., 2018). While additional RCTs are needed to verify these findings

(Wang et al., 2018), nurses caring for CV surgery patients on dexmedetomidine must be aware of the adverse side effects associated with this medication.

The current guidelines published by the SCCM and AGS only provide recommendations for critical care patients and general post-operative patients. The AGS guidelines (2015) suggest that nonpharmacological management strategies should be prioritized in all patients with delirium, while atypical antipsychotics should be used as the first line for pharmacological treatment of post-operative delirium only in patients who are agitated or in severe distress. In addition, the AGS (2015) suggests that only atypical, not typical, antipsychotics should be administered for post-operative delirium, and this should be at the lowest dose for the shortest duration. However, recent guidelines from the SCCM differ from the AGS, as they advise against routinely using both typical and atypical antipsychotics to treat delirium in critically ill patients and advise using typical and atypical antipsychotics only in the setting of a patient at risk for harming themselves or others (Devlin et al., 2018). Instead, the SCCM recommends using dexmedetomidine for delirium treatment in mechanically ventilated adults in whom delirium impedes the weaning and extubation processes (Devlin et al., 2018). Therefore, there is currently no one pharmacological agent that is most recommended in the treatment of delirium.

In summary, initial management of delirium should be based on treating identified modifiable risk factors and comorbid illnesses, as well as non-pharmacological interventions, such as optimizing sleep (AGS, 2015), instead of administrating antipsychotics as monotherapy (Arora & Kehler, 2020). Moreover, the approach to pharmacological treatment for delirium should be deferred to the responsible clinician, individualized to the specific patient, and based on evidence-based practice, current practice guidelines, and relevant hospital policies.

Implications for Practice

Critical care and cardiovascular nurses play a fundamental role in preventing, detecting, and managing delirium. It is important for nurses to have sufficient knowledge of delirium, as it has been shown that additional education provided to healthcare providers is associated with lower rates of post-operative delirium (AGS, 2015). Moreover, early detection and management of post-operative delirium reduces the risk of delirium-associated complications, improves patient safety, and facilitates a faster return to baseline cognitive functioning (Fraser et al., 2018).

Following CV surgery, patients are intubated, non-verbal, and experience challenges communicating. It can be difficult for nurses to identify delirium, especially when the patient is experiencing the predominant subtype of hypoactive delirium (Lough, 2014). Therefore, standardized, routine delirium screening and monitoring are important for CV surgery patients. Screening is particularly important for those who have predisposing risk factors for delirium and for those who have multiple comorbidities (Mattison, 2020). Given the risk factors for post-operative CV surgery delirium it is especially important to screen older adults who are deemed frail (Brown et al., 2016). Importantly, as per the SCCM recommendations, routine delirium screening of ICU patients should include the use of a valid screening tool (Devlin et al., 2018).

Registered nurses are the primary care providers for post-operative CV surgery patients and, as such, are responsible for implementing nonpharmacological and pharmacological interventions for patients experiencing delirium. However, it is important that the management of delirium is not exclusively determined by the bedside RN, as it is a shared and collaborative responsibility among all healthcare team members and should also include discussions with family members, as appropriate. Multidisciplinary action utilizing non-pharmacological interventions to prevent and treat delirium is recommended (AGS, 2015; Devlin et al., 2018). Delirium prevention and management strategies should be routinely discussed during multidisciplinary patient rounds and change of shift reports. Nurses are also well situated to lead quality improvement initiatives targeting prevention and the reduction of delirium-related complications.

There is currently a dearth of published nursing research on delirium in CV surgery patients. Future nursing research, especially qualitative research that explores patient and family experience, as well as the experiences of nurses caring for post-operative CV surgery patients experiencing delirium is warranted. In addition, further research regarding the prevention and non-pharmacological and pharmacological treatment of delirium is necessary, as delirium in CV surgery patients is unique from other patient populations.

Conclusion

The issue of delirium in the post-operative CV surgery environment will likely increase in the future due to the aging population and the increasing prevalence of CVD. The consequences of delirium including increased morbidity, mortality, and functional decline are detrimental to patients, families, and the healthcare system. Therefore, it is critically important for CV nurses to be well-informed about effective strategies for prevention and early and accurate detection, as well as optimal treatment, based on current practice guidelines. Finally, further research, particularly from the nursing perspective, is needed to reduce the incidence, minimize the negative consequences, and optimize the outcomes of delirium in the CV surgery population.

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