

Midterm outcomes after postoperative delirium on cognition and mood in patients after cardiac surgery

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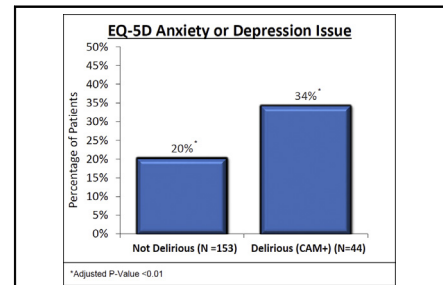
ABSTRACT

Objective: Delirium is a common neurologic complication after cardiac surgery. Our primary objective was to determine the impact of delirium on self-reported problems with midterm cognitive functioning and mood postcardiac surgery.

Methods: A single-center, prospective cohort study was conducted, enrolling 197 patients undergoing coronary artery bypass grafting or valve replacement. Baseline cognition and mood were assessed preoperatively in elective patients as a part of routine care using the Montreal Cognitive Assessment and Patient Health Questionnaire 9, respectively. During hospitalization, delirium was diagnosed using the Confusion Assessment Method (Confusion Assessment Method/Confusion Assessment Method Intensive Care Unit). Follow-up assessments were carried out via telephone interview at 6 to 9 months after cardiac surgery using the EuroQoL-5D, Patient Health Questionnaire 9, Alcohol Use Disorders Identification Test Consumption, Memory Impairment Screen, and Category Fluency Test assessments. We examined resultant scores in the domains of cognition and mood among delirious and nondelirious cohorts, controlling for confounders deemed clinically relevant.

Results: A total of 197 patients were enrolled in the study, of whom 44 (22%) developed postoperative delirium. After adjustment, no differences were observed in cognitive functioning between the delirious and nondelirious subjects after 6 to 9 months. However, delirious patients were more likely to experience self-reported problems in affective (depression and anxiety) functioning as measured by the EuroQoL-5D (odds ratio, 4.41; 95% confidence interval, 1.51-12.92; $P < .01$).

Conclusions: Postoperative delirium is associated with increased anxiety and depression at 6 to 9 months postcardiac surgery. Future investigation should seek to evaluate the utility of screening programs for affective disorders in those individuals who develop delirium in the postoperative period. (*J Thorac Cardiovasc Surg* 2017; ■:1-8)



Delirium places patients at increased risk for anxiety and depression after surgery.

Central Message

Postoperative delirium is common after cardiac surgery, placing patients at risk for subsequent anxiety and depression at midterm follow-up.

Perspective

Given the incidence of postoperative delirium among patients undergoing cardiac surgery and the risk for subsequent anxiety and depression, clinicians must consider ways to improve the health of this population. Various perioperative predictors identified to be associated with postoperative delirium may lend themselves to screening programs for affective disorders in these vulnerable individuals.

See Editorial Commentary page XXX.

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Delirium is an acute confusional state characterized by inattention, disorganized thinking, and altered, often fluctuating levels of consciousness.¹ It remains a common and increasingly prevalent neurologic complication after cardiac surgery, with current estimates of at least 1 in 7 patients



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Abbreviations and Acronyms

AUDIT-C	= Alcohol Use Disorders Identification Test Consumption
CAM	= Confusion Assessment Method
CAM-ICU	= Confusion Assessment Method for the ICU
CFT	= Category Fluency Test
EQ-5D	= EuroQoL-5D
euroSCORE	= European System for Cardiac Operative Risk Evaluation
MIS	= Memory Impairment Screen
MoCA	= Montreal Cognitive Assessment
OR	= odds ratio
PHQ-9	= Patient Health Questionnaire 9
RASS	= Richmond Agitation-Sedation Scale

affected.^{2,3} As the risk profile of surgical candidates continues to change with the inclusion of more extensive cardiovascular disease and medical comorbidities, the incidence of postoperative delirium is expected to increase.

Increasing attention has been paid to the negative effects of delirium on patient health outcomes, which include loss of patient independence, increased morbidity, and increased short- and long-term mortality.^{4,5} Cumulatively, the financial burden of delirium on healthcare systems is staggering.⁶ Although considered independent risk factors⁷ for the occurrence of postoperative delirium, cognitive and affective functional decline may occur secondary to delirium in some patients,⁸⁻¹¹ challenging persistent beliefs that acute changes in delirium are indeed transitory and reversible.

To date, a relationship between postoperative delirium and both cognitive impairment and affective functioning in the setting of cardiac surgery has not been extensively investigated.⁹⁻¹¹ Therefore, the purpose of our study was (1) to evaluate the effect of postoperative delirium on midterm (6-9 months) cognition in patients after cardiac surgery; (2) to evaluate the effect of postoperative delirium on mental health, including anxiety and depression, after cardiac surgery; and (3) to determine risk factors for each of these conditions.

MATERIALS AND METHODS**Study Population**

A prospective observational cohort study was carried out at the St Boniface Hospital, a tertiary care center in Winnipeg, Manitoba, with a patient catchment area of approximately 1.1 million people. The study was approved by the University of Manitoba Research Ethics Board and the St Boniface Hospital Research Review Committee Research Ethics Board number HS16100 (H2013:090). Patients who were aged more than 18 years, who were undergoing an elective cardiac surgery procedure, who were admitted to the intensive care cardiac surgery unit, and who attended a preoperative clinic were eligible to participate in this study. Patients in whom postoperative delirium could not reliably be tested (ie, because of previous debilitating stroke, cerebral palsy, severe dementia,

severe hearing disabilities, or inability to understand English or French, active seizure disorder, or Child-Pugh class B or C cirrhosis) were excluded from the study. Patient recruitment was limited to daytime hours Monday through Friday. Consecutively consenting patients were recruited from July 16, 2013, to July 15, 2014, with cardiac surgery dates from February 5, 2013, to February 25, 2014.

Perioperative Care

All patients undergoing cardiac surgery received a general anesthetic maintained with isoflurane. Sufentanil is the opioid of choice for induction. All patients undergo cardiopulmonary bypass. Approximately 40% to 60% of all patients are extubated in the operating room. On arrival to the intensive care cardiac surgery unit, all patients receive intermittent intravenous fentanyl, oral hydromorphone, and acetaminophen titrated for adequate postoperative analgesia. No routine benzodiazepines are used for sedation purposes of intubated patients, with propofol being the agent of choice. In addition, we encourage early ambulation, discourage daytime sleep, and offer melatonin at night for sleep.

Measurement and Outcomes

Preoperative, intraoperative, and postoperative parameters were extracted for consented patients from the Manitoba Cardiac Surgery Database and the patient's medical records. Preoperative data included patient demographics, surgical risk scores (European System for Cardiac Operative Risk Evaluation [euroSCORE] II¹²), medical history, cardiac risk factors, and cardiac illness severity. Baseline cognitive functioning and mood were assessed as a part of routine care using the Montreal Cognitive Assessment (MoCA)¹³ and Patient Health Questionnaire-9 (PHQ-9),¹⁴ respectively, for elective patients during their visit to the Cardiac Preoperative Assessment Clinic or preoperatively on the inpatient ward (ie, "in-house urgent" patients). Perioperative data included intraoperative anesthesia, cardiopulmonary bypass details, return to operating room because of bleeding, acute kidney injury, and cerebrovascular accident. In addition to collection of new postoperative delirium, postoperative data included intensive care unit (ICU) and hospital length of stay, 28-day in-hospital mortality, and major adverse events (including death, myocardial infarction, stroke, and renal failure requiring dialysis).

Patients were assessed for delirium routinely every 4 hours by bedside RN personnel while in the ICU using the Confusion Assessment Method for the ICU (CAM-ICU)¹⁵ and every 8 hours on the hospital wards using the Confusion Assessment Method (CAM).¹⁶ All personnel underwent formal education on the CAM-ICU and CAM tools using previously described implementation methodologies.^{17,18} Episodes of delirium were collected up to postoperative day 10. Patients were classified as having a delirious day if delirium was detected in at least 1 assessment during the 24-hour period of a given postoperative day. Patients were contacted and consented via telephone 6 to 9 months postcardiac surgery and underwent a telephone interview using standardized health surveys chosen to assess cognition, anxiety, depression, and substance abuse.

Affective functioning and substance abuse were evaluated 6 to 9 months after cardiac surgery through administration of the EuroQoL 5D (EQ-5D),^{19,20} PHQ-9,¹⁴ and Alcohol Use Disorders Identification Test Consumption (AUDIT-C)²¹ assessments. The PHQ-9 has been validated in various studies and incorporates the Diagnostic and Statistical Manual of Mental Disorders diagnostic criteria for depression. Depression from the PHQ-9 score was defined as a score of 5 or higher. The EQ-5D is a validated measure of health-related quality of life and was selected for its simplicity and proven clinical relevance.¹⁹ An individual was defined as having an "issue" with a given component of the EQ-5D if he/she reported a score of greater than 1. Furthermore, the AUDIT-C is a widely used, 3-item questionnaire on alcohol consumption habits. Patient subjective responses of having mild problems or worse were considered significant.

Midterm cognition was assessed using the Memory Impairment Screen (MIS)^{22,23} and the Category Fluency Test (CFT).²⁴ The MIS has been

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