Delirium after cardiac surgery
-risk factors, assessment methods and costs

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Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av medicine doktorsexamen framläggs till offentligt förvar i Aulan, Vårdvetarhuset, fredagen den 28 september,
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Background: Cardiac surgery is considered safe, but postoperative delirium (POD) remains frequently reported. Delirium is characterised by fluctuations in consciousness and cognition, and can be subdivided into disturbed psychomotoric activity (hyperactive and hypoactive) and psychiatric symptom profiles (psychotic and emotional). Delirium has an underlying cause that can be prevented and treated, provided the condition is detected. Undetected delirium could lead to serious consequences for the patient.

Aim: This thesis aims to understand the underlying risk factors of delirium, to compare different assessment methods and documentation, and to understand its effects on hospitalisation costs after cardiac surgery.

Methods: Two cohorts of patients undergoing cardiac surgery at the Heart Centre, Umeå University Hospital, Sweden were analysed. Cohort-A (Studies I-IV) enrolled 142 patients, ≥70 years of age, scheduled in 2009 for surgery with cardiopulmonary bypass (CPB). POD was diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders 4th ed, text rev (DSM-IV-TR), based on repetitive assessments with the Mini-Mental State Examination (MMSE) and the Organic Brain Syndrome (OBS) scale. This method was considered as reference. Predisposing and precipitating risk factors were explored (Study I), and a separate analysis was conducted with focus on CPB parameters (Study II). Patients were also assessed for POD with the Confusion Assessment Method (CAM), which was validated versus the reference method (Study III). Additionally in Study IV, data about how nurses assessed patients for POD symptoms using the Nursing Delirium Screening Scale (Nu-DESC) were analysed together with information extracted from the clinical database. Moreover, discharge summaries from both nurses and physicians were retrospectively reviewed for key words and expression associated with delirium. Cohort-B (Study V) included 1879 routine cardiac surgery patients (2014-2017) retrospectively extracted from the clinical database with concomitant Nu-DESC scoring. The association between the Nu-DESC and postoperative hospitalization costs was analysed.

Results: In cohort-A, 54.9% (78/142) patients developed POD. Both predisposing and precipitating risk factors were significantly associated with POD, of which the ‘volume load during operation’ had the strongest predictive influence (Study I). Among CPB variables the ‘duration of mixed-venous oxygen saturation <75%’ predicted POD (Study II). Hypoactive was more common than hyperactive delirium. Those with hypoactive delirium were less likely to be detected by the CAM method (Study III), an observation also demonstrated from information found in the clinical database and in discharge summaries. Nu-DESC did not detect all patients with POD, but significantly increased the detection rate (Study IV). The major hospitalisation costs associated with Nu-DESC ≥2 occurred in the ICU and independently of the surgical procedure performed. There were no significant differences in costs among patients with Nu-DESC ≥2, between age groups (70-year cut-off) or genders (Study V).

Conclusions: Both predisposing and precipitating risk factors contributed to POD and should be considered in future guidelines to prevent delirium after cardiac surgery. Hypoactive delirium was most common, but was the most difficult to detect without screening scales. Systematic assessment with Nu-DESC improved the detection rate of POD. Delirium after cardiac surgery has consequences on healthcare and is associated with increased costs.

Keywords: Cardiac surgery, Cardiopulmonary bypass, Consequences, Delirium, Detection, Documentation, Economical aspect, Hospitalization, Risk factors, Screening scales