Preoperative impaired executive functions but not memory are associated with postoperative delirium in cardiac surgery - A secondary analysis of a prospective observational study

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Background – Postoperative delirium (POD) is a frequent complication after cardiac surgery and it is associated with greater morbidity, mortality, as well as increased health care costs. While it is a well-known condition, the diagnosis of POD can remain difficult given its several existing phenotypes and its fluctuation over time. Preoperative identification of at risk cardiac surgery patients could be an effective way to prevent this complication.

Preoperative cognitive impairment is a leading predisposing factor for POD. However, performing a complete neuropsychological testing evaluating different cognitive domains is challenging in the preoperative period. In this regard, it has been previously reported that preoperative executive functions impairment is associated with greater risk of developing POD after coronary artery bypass grafting surgery.[1]

Goal of Study – We aimed to determine whether targeting a specific cognitive domain would predict POD and ease preoperative screening.

Methods – This is a secondary analysis of a prospective observational study (NCT03706989) on predictive factors of POD in cardiac surgery. We included 220 adult patients who underwent a first elective cardiac surgery with cardiopulmonary bypass (CPB).

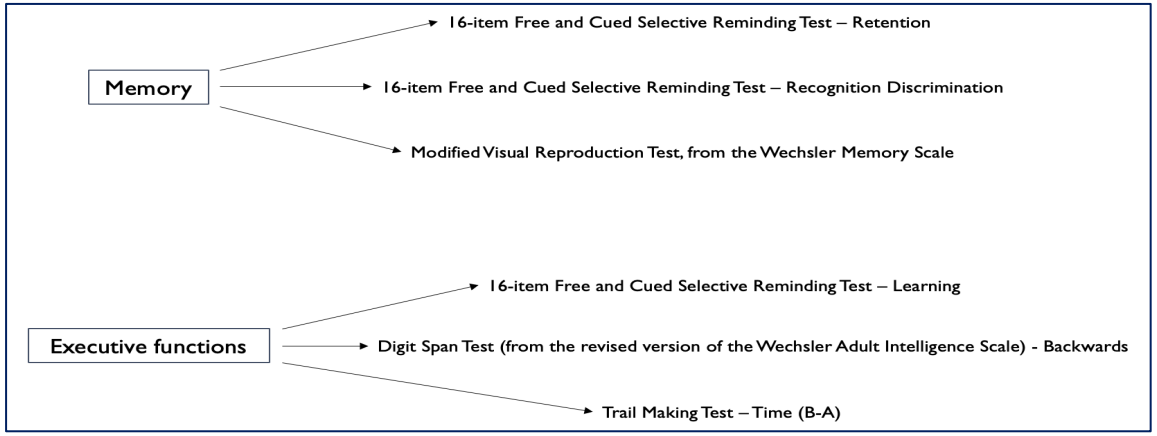

Figure 1 – **Categorization into memory and executive functions tests**

For every enrolled patient, a complete neuropsychological evaluation using a standardized battery of tests was systematically performed the day before surgery. For the purpose of this analysis, we extracted tests assessing either memory or executive functions to calculate two domain-specific Z-scores (Fig. 1).

POD was assessed in ICU using the CAM-ICU, after an evaluation of the level of consciousness by the RASS. At the ward, the CAM, in combination with a flowchart review, were used to screen any episode of POD until hospital discharge.

Statistical analysis – Comparisons between groups were performed using a Mann Whitney-U test for continuous variables and a Chi-square test for categorical variables

A binary regression analysis was used to evaluate the influence of domain-specific Z-scores on the occurrence of POD. A *p*-value < 0.05 was considered statistically significant.

Results – The incidence of POD was 29.5% (65/220 patients). Patients' characteristics and intraoperative data are detailed in Table 1. POD (+) patients were significantly older and had higher EuroSCORE II scores. There was no difference regarding the types of surgery between both groups (p = 0.180). However, POD (+) patients had higher CPB time than patients who did not develop POD.

Regarding pre-operative assessment, both Z-score "memory" (Z-score M) and Z-score "executive functions" (Z-score EF) were lower in delirious patients (Table 1).

	POD – (n = 155)	POD + (n = 65)	p
Age, y	67 (59-74)	74 (64-79)	<0.001
Sex, male	128 (82.6)	52 (80;0)	0.651
EuroSCORE II, %	1.50 (0.88-2.53)	2.43 (1.32-3.99)	<0.001
MMSE, /30	29 (27-29)	28 (26-29)	0.047
Surgical time, min	226 ± 57	238 ± 60	0.17
CPB time, min	99 ± 33	112 ± 40	0.02
Z-score memory	0.18 ± 0.77	-0.41 ± 1.31	< 0.001
Z-score executive functions	0.18 ± 0.86	-0.46 ± 1.15	< 0.001

Table 1 – Patients' characteristics and intraoperative data. Data are expressed as mean (± SD), medians (P_{25}-P_{75}) or numbers (%). MMSE = Mini Mental State Examination

However, in multivariate analysis, only a low Z-score EF increased the risk of POD (adj. OR [95% CI] = 0.63 [0.42-0.95]) and not Z-score M (adj. OR [95% CI] = 0.74 [0.48-1.15]).

Conclusions – Both results on memory and executive function tests were lower in delirious patients. However, only poor performances on tests of executive functions are independently associated with the occurrence of POD in cardiac surgery. Focusing preoperative evaluation on executive functions might ease cognitive assessment of patients in routine practice and help identifying patients at risk of POD.

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References – [1] Rudolph et al. J Am Geriatr Soc . 2006;54:937-41