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Caution in Drawing Conclusions on Long-Term Cognitive Recovery

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To the Editor:

We read with great interest the article by Brown *et al*¹ which reported an association between delirium diagnosis and cognitive dysfunction at one month in patients following cardiac surgery. The study is notable for its rigorous delirium assessment and thorough neuropsychologic battery testing at multiple perioperative time points. The conclusion that there is no difference in cognitive change at one year between delirious and non-delirious patients, however, should be interpreted with caution. In addition to being potentially underpowered, the study measured delirium as a dichotomous yes/no despite previous findings that longer durations of delirium have greater impact on long-term cognitive impairment^{2,3} and that increased delirium severity is associated with worse outcomes.^{4,5} Brown *et al*'s findings of lower cognitive function scores, starting with baseline assessments, for those who develop postoperative delirium are in agreement with other studies demonstrating the large contribution of preoperative cognitive performance to both acute and long-term brain dysfunction after surgery.^{6–8} The question of whether this signifies a continuation of a downward trajectory initiated prior to surgery, is a reflection of greater baseline comorbidities, or has another explanation has yet to be answered.

The description of resilience, or return to cognitive baseline following episode of post-operative delirium, has previously been described by Inouye and colleagues who went on to show an accelerated cognitive decline at out to 36-months.⁹ It would be interesting to see if these patients would have the same biphasic decline within domain-specific cognitive scoring. From a patient perspective, it would also be important to qualify the clinical impact of a lower overall cognitive Z-score and domain-specific cognitive scores. This could help answer whether statistically insignificant changes measured with composite cognitive scoring could potentially miss the clinical impact of delayed executive function, verbal fluency, and other domains that greatly impact patient life or whether statistically significant decline on robust in-depth testing during studies translates into appreciable deficits in the real-world.

The study by Brown *et al*¹ is important in adding to the growing body of literature attempting to define the inter-relationship between post-operative delirium and cognitive

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decline, particularly regarding domain-specific analysis. Trials aimed at reducing delirium and postoperative decline that include similar rigorous assessments but also mechanistic testing are needed. We feel that it is essential to note the *potential* for recovery of cognition after acute brain dysfunction, but that the extent and quality of that recovery remains to be seen.

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REFERENCES:

1. Brown CH 4th, Probert J, Healy R, Parish M, Nomura Y, Yamaguchi A, Tian J, Zehr K, Mandal K, Kamath V, Neufeld KJ, Hogue CW: Cognitive Decline after Delirium in Patients Undergoing Cardiac Surgery. *Anesthesiology* 2018; 129: 406–16 [PubMed: 29771710]
2. Pandharipande PP, Girard TD, Jackson JC, Morandi A, Thompson JL, Pun BT, Brummel NE, Hughes CG, Vasilevskis EE, Shintani AK, Moons KG, Geevarghese SK, Canonico A, Hopkins RO, Bernard GR, Dittus RS, Ely EW, BRAIN-ICU Study Investigators: Long-Term Cognitive Impairment after Critical Illness. *N Engl J Med* 2013; 369: 1306–1316 [PubMed: 24088092]
3. Hughes CG, Patel MB, Jackson JC, Girard TD, Geevarghese SK, Norman BC, Thompson JL, Chandrasekhar R, Brummel NE, May AK, Elstad MR, Wasserstein ML, Goodman RB, Moons KG, Dittus RS, Ely EW, Pandharipande PP, MIND-ICU, BRAIN-ICU Investigators: Surgery and Anesthesia Exposure is Not a Risk Factor for Cognitive Impairment After Major Noncardiac Surgery and Critical Illness. *Ann Surg* 2017; 265(6): 1126–1133 [PubMed: 27433893]
4. Khan BA, Perkins AJ, Gao S, Hui SL, Campbell NL, Farber MO, Chlan LL, Boustan MA: The CAM-ICU-7 Delirium Severity Scale: A Novel Delirium Severity Instrument for Use in the Intensive Care Unit. *Crit Care Med* 2017; 45(5): 851–857 [PubMed: 28263192]
5. Inouye SK, Kosar CM, Tommet D, Schmitt EM, Puella MR, Saczynski JS, Marcantonio ER, Jones RN: The CAM-S: Development and Validation of a New Scoring System for Delirium Severity in 2 Cohorts. *Ann Intern Med* 2014; 160(8): 526–533. [PubMed: 24733193]
6. Lingehall HC, Smulter NS, Lindahl E, Lindkvist M, Engström KG, Gustafson YG, Olofsson B: Preoperative Cognitive Performance and Postoperative Delirium Are Independently Associated With Future Dementia in Older People Who Have Undergone Cardiac Surgery: A Longitudinal Cohort Study. *Crit Care Med* 2017; 45(8): 1295–1303. [PubMed: 28481752]
7. Culley DJ, Flaherty D, Fahey MC, Rudolph JL, Javedan H, Huang CC, Wright J, Bader AM, Hyman BT, Blacker D, Crosby G: Poor Performance on a Preoperative Cognitive Screening Test Predicts Postoperative Complications in Older Orthopedic Surgical Patients. *Anesthesiology* 2017; 127: 765–774 [PubMed: 28891828]
8. Saczynski JS, Marcantonio ER, Quach L, Fong TG, Gross A, Inouye SK, Jones RN: Cognitive Trajectories after Postoperative Delirium. *N Engl J Med* 2012; 367(1): 30–9 [PubMed: 22762316]
9. Inouye SK, Marcantonio ER, Kosar CM, Tommet D, Schmitt EM, Trivison TG, Saczynski JS, Ngo LH, Alsop DC, Jones RN: The Short- and Long-Term Relationship between Delirium and Cognitive Trajectory in Older Surgical Patients. *Alzheimers Demet* 2016; 12(7): 766–775