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Is Postoperative Cognitive Decline Clinically Relevant?

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We applaud Dr. Avidan and colleagues in their assessment of the general relationship between postoperative cognitive dysfunction (POCD) and dementing illness.¹ We have a number of questions and concerns we hope the authors might address.

As noted by the authors, the report revisits the question of whether geriatric patients who undergo surgery have a more rapid decline into dementia than patients who do not have surgery. However, our interest as physicians may be better stated as examining whether POCD is clinically relevant. Previously, large studies of POCD in noncardiac surgery have shown an incidence of about 10% at 3 months.^{2;3} Williams-Russo reported a rate of about 5% at 6 months⁴, while the long-term follow up of international study on POCD found a difference of about 1% from the control patients.⁵ It has already been established that most patients seem to recover, albeit over a prolonged period of time. Given their negative finding, it would be helpful if the authors could provide some insight into the statistical power of their advanced statistical approach. Since the relationship of the testing sessions in the Alzheimer's Disease Research Center group to the events in questions is highly variable and the incidence of POCD decreases over time, a clear statement of the study's statistical power is critical to understanding the importance of the current report. We suspect that the study may have been underpowered because of the limited number of major surgical procedures in the sample. We would predict that one would have to examine over 6,700 patient records per group to detect a 1% difference at 1 yr. In any case, we do not agree that cognitive effects that last less than 1 yr are clinically unimportant and therefore question the authors advice that "The decision to proceed with surgery in elderly people, including those with early Alzheimer disease, may be made without factoring in the specter of persistent cognitive deterioration." Three or six months of cognitive

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RE: Avidan MS, Searleman AC, Storandt M, Barnett K, Vannucci A, Saager L, Xiong C, Grant EA, Kaiser D, Morris JC, Evers AS: Long-term cognitive decline in older subjects was not attributable to noncardiac surgery or major illness. *Anesthesiology* 2009; 111:964–70

deterioration may indeed profoundly impair quality of life and have significant socioeconomic consequences.

The importance of the preoperative trajectory has not been discussed in most reports of POCD, but is an extremely interesting idea that the authors might develop further. As most patients in the United States are scheduled for surgery within at most a few months of their procedure, would testing at that point be more relevant? If the type of testing suggested by the author's analysis would be clinically impractical, does the current data set provide data regarding the magnitude of the issue and some insight how to compensate appropriately?

While the authors note the well-known controversies regarding what standard should be used to define POCD, the majority of the POCD literature has defined POCD through cognitive testing of specific area, generally memory and executive function. In this paper the authors use an instrument used to define dementia: the Clinical Dementia Rating Scale. Dementia, as rated by the Clinical Dementia Rating, is a much broader concept that includes assessment of community affairs, home and hobbies and personal care in addition to psychometric alterations. The authors do not present a rationale for suggesting that marked alteration in the Clinical Dementia Rating at 1 yr is more, or less, compelling than the methodologies employed by previous studies. While this scale does provide an important link to dementia research, it will be difficult to compare the current result to majority of the literature published to date.

It is difficult to understand the nature of the simulated event that defines the control group in this study. If these are the controls, then they are all preevent; therefore, it would be helpful to understand how the simulated event was determined. Was the process one of simply selecting a date which was called an event, with determinations then falling before and after? What impact does the selection of the simulated events have on the subsequent outcome? What is the interpretation of a change in slope after an event that did not actually occur?

The authors bring up a number of serious concerns about control groups and their relevance to the definition of POCD. We agree with the authors' concerns regarding the constitution of an appropriate control group. However, we do not understand how the current analysis provides evidence that such control groups are unnecessary in prospective clinical studies.

The authors restrict inclusion criteria to those with a postevent observation. This inclusion criterion will result in a potential bias in the postevent estimates because the analytic model assumes that those who died or were lost to follow-up have the same trajectories as those who remain under follow-up. A joint effects model⁶ that would include not only the cognitive trajectories but also the survival curves may result in unbiased estimates. However, because the proportion of subjects who died during follow-up within each group is not reported, readers cannot determine whether deaths differentially occurred.

The authors acknowledge a skewed distribution in the number of observations pre- and postevent for the surgical and illness groups but did not find these statistically significant. The important difference may be that the illness group had a median 1.3 more annual preevent observation to contribute to their slope estimate. For POCD, one would expect that post-event decline was greatest close to the event. The illness group had a median difference of 1.7 fewer annual postevent measures contributing to their slope estimate. As these pre- and postevent measures are linear and marginal, it is conceivable that having a different number of observations pre- and postevent could mask important differences.

Once again, we applaud the investigators' effort to facilitate our understanding of this information.

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