**Neuropsychological Test Battery:**

The neuropsychological tests were selected because they have been used commonly and recommended in an expert consensus statement.13 The test battery consisted of the Consortium Copyright © 2015, the American Society of Anesthesiologists, Inc. Wolters Kluwer Health, Inc. Unauthorized reproduction of this article is prohibited. Downloaded from anesthesiology.pubs.asahq.org by guest on 02/19/2020 Anesthesiology 2015; 122:1224-34 1226 Silbert et al. Cognition and Noncardiac Surgery to Establish a Registry in Alzheimer Disease (CERAD) Auditory Verbal Learning Test, Trail Making Test Parts A and B, Digit Symbol Substitution Test, Controlled Oral Word Association Test, CERAD Semantic Fluency Test (animals), and the Grooved Pegboard Test (dominant and nondominant hands). All of these tests have been described elsewhere.5 All tests were used for assessment of POCD and cognitive decline. Preexisting cognitive impairment (PreCI), which is a measure of cognition (vide infra), was calculated using all cognitive tests except the Digit Symbol Substitution Test, which was excluded because we did not have access to appropriate population norms. Visual analog scales were used to assess anxiety and depression at each time of testing. These are especially suitable for this situation because they offer simple, reliable, and valid techniques for measuring anxiety and depression while placing minimal demands on patients.14,15 Patients were asked to mark an ungraded line (10 cm in length) anchored by 0 and 100 at either end. Absolute test scores were reversed for timed tasks so that a decrease implied cognitive decline for every test. Parallel forms were administered for the CERAD Auditory Verbal Learning Test, and all the tests were administered in the same order at all time points. The National Adult Reading Test was used to estimate intelligence quotient16 and was administered at the baseline assessment. Calculation of Preoperative Cognitive Status We used a measure of preoperative cognitive status

**Calculation of the Reliable Change Index:**

RCIs were determined by subtracting the preoperative score (*X*1) from the postoperative score (*X*2), giving

Δ*X* for each individual participant for a given task. The mean change for the controls Δ*X*c, calculated in the same way, was then subtracted from this, removing any practice effect. This score was then divided by the SD for the change in test results of the control group SD(Δ*X*c), controlling for the expected variability. These scores were then used to create a combined test score (*Z*combined) using the sum of *Z* scores for each test (Σ*Z*a,b,c,d,*etc*.) divided by the SD of this summation in the control group [SD(Σ*Z*control)]. POCD and cognitive decline were defined in an individual when their RCI score was less than –1.96 on at least 2 tests, and/or their combined *Z* score was less than –1.96. This classifies POCD or cognitive decline on the basis of a substantial failure on two or more tests or a more pervasive subtle decline across the neuropsychological test battery.

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| **Deficits counted**  | **Points** (max denominator 55) | **ACE data source/variable** | **Points** |
| Motivation | Low=1 | Questionnaire 20b. During the past four weeks, have you accomplished less than you would like as a result of emotional problems (eg. Feeling depressed or anxious)?Yes/No | Yes = 1No = 0 |
| Self rated health | Excellent= 0 Good= 0.25Fair =0.5Poor/can’t say=1 | Questionnaire 19. In general would you say your health is:Excellent, very good, good, fair, poor? | Excellent= 0Good= 0.25Fair =0.5Poor/can’t say = 1 |
| Cognition | Dementia= 1, Mild cog. Imp.= 0.5 Delirium =1Agitation =1Delusions or hallucinations =1 | PreCI / MCI / Any periop haloperidol  | Yes = 1No = 0 |
| AMTS | 6 or less =1> 6=0 | MMSE (use validated cutpoint equiv to AMTS cutpoint) | MMSE < 19 = 1MMSE ≥ 19 = 0 |
| Emotional state | Anxiety =1Recent bereavement =1Depression =1Fatigue =1 | GDSVAS anxiety VAS fatigue | VAS depression > 50 = 1VAS anxiety > 50 = 1VAS fatigue > 50 = 1 |
| Sleep | Poor or disrupted =1Daytime drowsiness =1 | Questionnaire - Comment on your current sleep, appetite, your overall activity | Poor or disrupted =1Daytime drowsiness =1 |
| Speech | Impaired =1 | Questionnaire - Describe your current thinking abilities: for example, your mental alertness, memory and/or confusion; any difficulty speaking or understanding? | Impaired = 1 |
| Hearing | Impaired =1 | Questionnaire - Can you usually hear and understand when someone is talking in a normal voice?Yes/No | No = 1Yes = 0 |
| Vision (with glasses) | Impaired =1 | Questionnaire - Can you see well enough (with glasses if necessary) to recognise a friend across the street?Yes/No | No = 1Yes = 0 |
| Weight | Underweight =1 Obese =1 slightly overweight =0 | Med history | Obese = 1 |
| Weight change | Loss =1 significant gain =1 |  |  |
| Appetite | Poor =1fair =0.5normal =0 | Questionnaire – Comment on your current sleep, appetite, your overall activity. | Poor =1fair =0.5normal =0 |
| Continence | Bowels incontinent =1Bladder incontinent/catheter =1 | Questionnaire - Please comment on Sphincter controlNormal, occasionally wets the bed, frequently wets the bed, incontinent | Incontinent = 1Frequently= 0.75Occasionally= 0.5Normal = 0 |
| Medical History (scoring 1 point each) | Hypertension Asthma/ Chronic obstructive lung diseaseStroke/ Transient ischaemic attackAngina/ Myocardial infarctionHeart FailureDiabetesActive cancerAlcohol excessPressure soresHip fractureOsteoarthritis/ osteoporosisParkinson’s disease1st other medical problem2nd other medical problem | Medical history | HypertensionLung diseaseTransient ischaemic attack Angina/ Myocardial infarctionHeart FailureDiabetesArthritisOther medical problem |
| No. of medications in 24 hours | 0-4 =0, 5-9 =1, 10-14 =2, 15-19 =3, 20-24 =4, >25 =5 | Medications list (BL) | 0-4 =0, 5-9 =1, 10-14 =2, 15-19 =3, 20-24 =4, >25 =5 |
| Transfers | Dependent =1 Assistance =0.5 | Questionnaire - Are you able to shop for your needs independently? Yes/No | No = 1Yes = 0 |
| Walking | Dependent =1 Assistance =0.5 | Questionnaire - Can you walk two blocks without help? Yes/No | No = 1Yes = 0 |
| Sitting balance | Impaired =1 | Questionnaire - Can you walk up and down one flight of stairs without help?Yes/No | No = 1Yes = 0 |
| Falls in the last 6 months | 3 or more =1 | Questionnaire - Can you walk up and down several flights of stairs without help?Yes/No | No = 1Yes = 0 |
| Feeding | Dependent =1 Assistance =0.5 | Partner questionnaire - Eating habits:Cleanly, messily (only with spoon), simple solids, requires feeding | Dependent =1 Assistance =0.5 |
| Washing | Dependent =1 Assistance =0.5 | Questionnaire - Washing, grooming:Unaided, needs prompting, sometimes needs help, always needs help | Dependent =1 Assistance =0.5 |
| Dressing | Dependent =1 Assistance =0.5 | Questionnaire - Dressing:Unaided, occasionally wrong, wrong sequence/forgot item, unable to dress | Dependent =1 Assistance =0.5 |
| Could manage own medications | Dependent =1 Assistance =0.5 | Questionnaire - Did he/she prepare a meal or a snack in the last three months?Don’t know, as well as usual, with some difficulty, with a lot of difficulty, unable | Dependent =1 Assistance =0.5 |
| Could manage own finances | Dependent =1 Assistance =0.5 | Questionnaire - Are you able to organise financial matters (eg. Pension, dealing with the bank)? Yes/NoQuestionnaire - Handling financial matters (eg. Pension, dealing with the bank)?Much improved, a bit improved, same, a bit worse, much worse | Dependent =1 Assistance =0.5  |
| Total | N=51 |  | N = 37 |

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| Frailty domain | Item | Points | ACE data | Points |
| Cognition | Clock drawing test: Place hands to indicate time of “ten past eleven” on pre-drawn circle without numbers | No errors = 0Minor spacing errors =1Other errors = 2 | Pentagon | No errors = 0Incorrect # of angles = 1Other errors = 2 |
| General health status | # hospital admissions in past year | None = 01-2 visits = 12+ = 2  | Med Hx | None = 01-2 visits = 12+ = 2 |
|  | How would you describe your overall health? | Excellent/Very good = 0Fair = 1Poor = 2 | Questionnaire 19. In general would you say your health is:Excellent, very good, good, fair, poor? | Excellent/Very good = 0Fair = 1Poor = 2 |
| Functional independence | With how many of the following activities do you require help?(eg. Meal prep, shopping, transportation, telephone, housekeeping, laundry, managing money, taking meds) | * 1. = 0

2-4 = 1 5-8 = 2 | Questionnaire7. Are you able to shop for your needs independently? Yes/No8. Are you able to organise financial matters (eg pension, dealing with the bank)? Yes/No26. In the past 3 months, did you drive a car without getting lost, or travel to wherever you needed by public or other transport?With no difficulty, with a little difficulty, with a lot of difficulty, unablePartner Questionnaire13. Handling money for shopping?Much improved, a bit improved, same, a bit worse, much worse14. Handling financial matters? Much improved, a bit improved, same, a bit worse, much worse17. Did he/she prepare a meal or a snack in the last 3 months?Don’t know, as well as usual, with some difficulty, with a lot of difficulty, unable | * 1. = 0

2-4 = 1 5-8 = 2 |
| Social Support | When you need help, can you count on someone who is willing and able to meet your needs? | Always = 0Sometimes =1Never = 2 | Did the patient have someone to fill out the Partner Questionnaire, and if so, how much of the questionnaire was completed? | Yes, >50% = 0Yes, ≥0% = 1 No = 2 |
| Medication use | Do you use five or more different prescription meds? | No = 0Yes = 1 | Med Hx | No = 0Yes = 1 |
|  | Do you forget to take your medications? | No = 0Yes = 1 |  |  |
| Nutrition  | Have you recently lost weight such that your clothing has become looser? | No = 0Yes = 1 | Med Hx | No = 0Yes = 1 |
| Mood | Do you often feel sad or depressed? | No = 0Yes = 1 | GDS | ≤6 = 0>6 = 1 |
| Continence | Do you have a problem with losing control of urine when you don’t want to? | No = 0Yes = 1 | Partner questionnaire34d. Please comment on Sphincter controlNormal, occasionally wets the bed, frequently wets the bed, incontinent | Normal = 0Incontinent/ Frequently/ Occasionally= 1 |
| Functional Performance | Two weeks ago were you able to:(1) Do heavy work around the house like washing windows,walls or floors without help? (2) Walk up and down stairs to the second floor without help?(3) Walk 1 km without help? | 1) No = 1 Yes = 02) No = 1 Yes = 03) No = 1 Yes = 0 | Pegboard completed within normal time compared with controls | No = 1Yes = 0 |
| Total | Sum of column totals |  / 18 |  | /15 |