Functional Capacity as a Significant Independent Predictor of Postoperative Mortality for Octogenarian ASA-III Patients


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Background. The American Society of Anesthesiology’s (ASA) 6-point physical status classification remains one of the most significant predictors of perioperative morbidity and mortality and is the most widely used risk stratification tool worldwide. Its utility is significantly limited for octogenarians, however, as the majority of these patients are classified as ASA-III. Thus, for patients aged 80 or older, we hypothesized that incorporating patients’ functional status, defined by the ability to perform activities of daily living independently, would improve perioperative risk stratification.

Methods. All data were extracted from the Veterans Affairs Surgical Quality Improvement Program, a perioperative prospectively maintained computerized database. ASA-III patients were reclassified into subgroups IIIA or IIIB, with IIIA representing functionally independent patients and IIIB representing partially or fully dependent patients. Functional status was self-reported during preoperative assessments. In this database, mortality data (primary outcome) was reliably available for all patients for the duration of the 96-month follow-up period, as were other perioperative patient data.

Results. Seven hundred and fifty-nine (72.4%) patients were classified as ASA-IIIA, and 290 (27.6%) patients were ASA-IIIB. Thirty-day and long-term survival was significantly better in the ASA-IIIA group, irrespective of type of surgery (hazard ratio 1.87, confidence interval 1.55–2.25, p < .001). ASA-IIIB hazard ratios for mortality were greatest for orthopedic and vascular surgery patients, but a significant divergence in survival between ASA-IIIA and IIIB patients was observed in all surgical specialties.

Conclusion. As evidenced by Kaplan–Meier and multivariate analyses, functional capacity was a significant independent predictor of mortality for ASA-III patients older than 80 years of age.

Key Words: Octogenarians—American Society of Anesthesiologists Functional Class—Surgery—Outcome—Complications.

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The American Society of Anesthesiology’s (ASA) physical status classification was initially proposed in 1941 (1), modified in 1961 (2), and validated retrospectively and prospectively (3–5) and is currently the most widely used and standard component of preoperative assessment of the physical status of surgical patients. It is a simple system based on clinical assessment only, without the additional need for laboratory and diagnostic tests or often-cumbersome mathematical formulas, and is completed during the routine preoperative anesthesia assessment (6). This classification has been shown to be one of the most significant predictors of morbidity and mortality (5,7–13), providing guidance to surgeons and anesthesiologists regarding perioperative management and monitoring, along with early identification and prediction of postoperative intensive care requirements. Despite the proven efficacy of this 6-point classification system, its utility among Veterans Affairs Western New York (VAWNY) patients aged 80 or older was significantly limited as the majority of these patients were classified as ASA-III (14). Without the variability of classes seen in other populations, octogenarians suffer limited utility in the use of the current ASA classification system for stratification of their individual perioperative risks.

A number of risk-factor assessment systems have been proposed using a variety of data in an effort to improve the preoperative risk assessment of surgical patients (8,9,15–19), but none have been broadly adopted to replace the simple, widely used ASA classification. In fact, several of these proposed risk stratification systems incorporate the ASA classification. Along with other factors, both mortality and complication rates from major surgery have been documented to rise with rising age (8,9,20). To date, few studies has evaluated the impact of patients’ preoperative functional status into a perioperative risk assessment model for patients older than 80 years of age.
Reclassification of the ASA-III patients to IIIA or IIIB according to each patient’s functional capacity has been shown to reliably predict postoperative morbidity and mortality in ASA-III patients undergoing peripheral revascularization (21,22). While these analyses have been done in vascular surgery patients, studies assessing the value of subdividing ASA classes based on functional capacity in a general surgical population are lacking. Noting the rise in the aging population and the number of octogenarians presenting for all types of surgery, along with the increase in morbidity and mortality seen with increasing age, we were obligated to improve upon the current ASA classification system for this population. Thus, we hypothesized that the reclassification of ASA-III patients into subgroups IIIA or IIIB based on functional capacity, as defined by the Veterans Affairs Surgical Quality Improvement Program (VASQIP), can be used to better predict perioperative risk, including both 30-day and long-term survival in a population of patients older than 80 years of age.

Methods

Study Design

The study protocol was reviewed and approved by the Institutional Review Board at the Buffalo Veterans Affairs Medical Center. A total of 1,612 patients (98.4% male patients) aged 80 or older presented to the Veterans Affairs Western New York Healthcare System between 1998 and 2008 and underwent at least one noncardiac surgery. Data for each participant were entered into VASQIP, a prospectively maintained computerized database. No patients were excluded. Each patient’s functional status, defined as a patient’s ability to independently perform all activities of daily living (ADL), was self-reported by patients or family members and prospectively assessed by anesthesia personnel during the preoperative patient interview, then entered into the surgical quality improvement database. In the VASQIP database, patients deemed to be functionally independent were coded as 1, whereas patients who were partially dependent on others for at least one ADL were coded as 2, and those fully dependent on others for their ADLs were coded as 3. For this study’s purposes and not to be mixed with the traditional ASA classification, functionally independent patients were recoded by adding a suffix of “A” to the ASA class and those who were either partially or fully dependent were identified by adding the suffix of “B.” A member of the anesthesia department examined all patients before any operative intervention and determined each patient’s ASA class, as previously defined (6).

The patients’ ASA class, functional status, comorbidities, clinical characteristics, demographic characteristics, functional status, preoperative laboratory data, type of anesthesia used (local, epidural/spinal, general), procedures performed, length of stay, and perioperative morbidity and mortality were incorporated into the data analyzed and compared between groups. Board-certified surgeons performed all operative procedures. With the use of the computerized charting system in Veterans Affairs Hospitals, information on the time to death was available for all patients in our series. The VASQIP database has previously been found to have a very high specificity and sensitivity for death and date of death (23).

The current definition for ASA class III is as follows: “a patient with severe systemic disease,” noted to be between ASA-II (a patient with mild systemic disease) and ASA-IV (a patient with severe systemic disease that is a constant threat to life) (1). Perioperative morbidities were defined as those that were recorded less than or equal to 30 days after the index procedure. Postoperative myocardial infarctions were diagnosed by electrocardiography changes with or without angina and confirmed by elevations of serum troponin-I and creatinine kinase-MB levels. Routine troponin-I or creatinine kinase-MB testing in the absence of clinical suspicion for myocardial injury was not performed. A cerebrovascular accident was defined as any cerebral event including transient ischemic attacks and strokes. Perioperative deaths were those occurring less than or equal to 30 days of the index procedure. Additional definitions can be found in Supplemental Material: Definitions.

Statistical Analysis

Patients’ demographic characteristics and morbidities were reported using descriptive statistics. The Fisher exact test or χ² test was used to compare categorical variables between the two groups (ASA-IIIa and ASA-IIIb), and the t test was used to compare continuous variables. Logistic regression analysis was used to evaluate the associations between subclassifications and 30-day postoperative complications. Odds ratios were reported with 95% confidence interval (CI) and p values <.05 were considered statistically significant. Univariate Cox proportional hazard modeling (24) was used to identify potential factors associated with survival, and candidate variables included the following: coronary artery disease, hypertension, diabetes mellitus, chronic obstructive pulmonary disease, cerebral vascular disease, renal insufficiency, hyperlipidemia, and preoperative albumin level. Significant variables selected from the univariate Cox model were included in a stepwise multivariate Cox proportional analysis to evaluate their independent prognostic effects. Hazard ratios (HR) and 95% confidence limits were reported with their corresponding p values. Kaplan–Meier analysis was used to compare overall survival for each of the subclassifications (25), and the log-rank test was used for comparison between groups. All p values are two sided with α level = 0.05. Data analysis was performed using NCSS version 2007 (Salt Lake, UT).
There were 1,612 surgical patients of at least 80 years of age in this sample. One patient was classified as ASA-I; 162 (10.0%) as ASA-II; 1,049 (65.1%) as ASA-III; 386 (23.9%) as ASA-IV; and 14 (0.9%) as ASA-V. Of the 65.1% of patients in the ASA-III group, 759 (72.4%) patients were classified as ASA-IIIa and 290 (27.6%) were ASA-IIIb. Of them, 98.4% were men.

Demographics, comorbidities, and preoperative laboratory data are reported in Table 1. ASA-IIIa patients were a mean of 1 year younger. There was no difference in sex and 98.4% were men. ASA-IIIa group patients had a significantly higher body mass index and greater prevalence of hypertension, but diabetes mellitus, congestive heart failure, peripheral vascular diseases critical limb ischemia, hemodialysis, and cerebrovascular accidents with neurological deficits were all significantly more prevalent in the IIIb group. There were no significant differences for chronic obstructive pulmonary diseases, angina, previous cardiac surgery or percutaneous transluminal coronary angioplasty, disseminated cancer, alcohol abuse, or smoking. A greater number of ASA-IIIb patients had a do not resuscitate (DNR) status documented.

Albumin and hematocrit were greater in IIIa patients, whereas alkaline phosphatase, blood urea nitrogen, platelets, prothrombin time, and partial thromboplastin time were greater in IIIb patients. There were no differences in bilirubin, creatinine, or white blood cell count (Table 1).

The length of stay was significantly longer in IIIb patients (10.1 ± 11.7 days) than for IIIa patients (7.0 ± 9.3 days, p < .001) with IIIb patients having significantly more postoperative complications (Table 2). Postoperative pneumonia, urinary tract infections, wound dehiscence, renal insufficiency, and 30-day mortality were all significantly greater in the IIIb group.

Postoperative mortality was significantly higher in IIIb patients (HR 1.87, 95% CI 1.55–2.25, p < .001, Figure 1). Hazard ratios for mortality were even greater for ASA-IIIb patients among younger VAWNY cohorts, but IIIb patients displayed improved survival in these age groups compared with their IIIA octogenarian counterparts (Figure 1). It is also worth noting that the proportion of patients classified as ASA-III was significantly lower in the younger age groups, with 36.5% of patients younger than 60 years of age being ASA-III and rising consecutively with each age group to 65.1% for octogenarians.

Table 1. Demographics, Comorbidities, and Preoperative Laboratory Values in ASA-IIIa and ASA-IIIb Patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>ASA-IIIa</th>
<th>ASA-IIIb</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>83.2 ± 2.8</td>
<td>84.2 ± 3.4</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Male patients n (%)</td>
<td>750 (98.7)</td>
<td>284 (97.6)</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>26.7 ± 5.2</td>
<td>25.4 ± 4.6</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Hypertension n (%)</td>
<td>399 (83.0)</td>
<td>115 (70.1)</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Diabetes mellitus n (%)</td>
<td>151 (19.9)</td>
<td>73 (25.1)</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Angina pectoris n (%)</td>
<td>16 (3.3)</td>
<td>2 (1.2)</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Congestive heart failure n (%)</td>
<td>18 (2.4)</td>
<td>15 (5.2)</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Prior coronary revascularization n (%)</td>
<td>122 (32.8)</td>
<td>42 (30.7)</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease n (%)</td>
<td>168 (22.1)</td>
<td>73 (25.1)</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Prior stroke n (%)</td>
<td>40 (5.3)</td>
<td>31 (10.7)</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Peripheral arterial disease n (%)</td>
<td>28 (5.8)</td>
<td>39 (23.8)</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Critical limb ischemia n (%)</td>
<td>21 (4.4)</td>
<td>26 (15.9)</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Dialysis n (%)</td>
<td>4 (0.5)</td>
<td>8 (2.7)</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Disseminated cancer n (%)</td>
<td>18 (2.4)</td>
<td>6 (2.1)</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Alcohol abuse n (%)</td>
<td>18 (2.4)</td>
<td>7 (2.4)</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Active smoking n (%)</td>
<td>69 (9.1)</td>
<td>23 (7.9)</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Do NOT resuscitate n (%)</td>
<td>18 (2.4)</td>
<td>51 (17.5)</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Serum albumin (mg/dL)</td>
<td>3.5 ± 0.6</td>
<td>3.1 ± 0.7</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Total bilirubin (mg/dL)</td>
<td>0.76 ± 0.91</td>
<td>0.64 ± 0.43</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Alkaline phosphatase (units)</td>
<td>97 ± 47</td>
<td>104 ± 54</td>
<td>&lt;.046*</td>
</tr>
<tr>
<td>Blood urea nitrogen (mg/dL)</td>
<td>23.1 ± 10.6</td>
<td>26.3 ± 13.4</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Creatinine (mg/dL)</td>
<td>1.3 ± 0.6</td>
<td>1.4 ± 0.9</td>
<td>&gt;.05</td>
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<tr>
<td>Hematocrit (%)</td>
<td>38.9 ± 5.0</td>
<td>35.1 ± 5.3</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>White blood cell count (×1000 cells/mm³)</td>
<td>8.2 ± 9.5</td>
<td>9.4 ± 7.2</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Platelet (×1000 count/mm³)</td>
<td>220 ± 83</td>
<td>239 ± 100</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Prothrombin time (s)</td>
<td>12.0 ± 2.2</td>
<td>12.7 ± 2.6</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Partial thromboplastin time (s)</td>
<td>28.6 ± 7.6</td>
<td>30.1 ± 8.2</td>
<td>&gt;.05</td>
</tr>
<tr>
<td>Serum sodium (mEq/L)</td>
<td>139 ± 3</td>
<td>138 ± 4</td>
<td>&gt;.01</td>
</tr>
</tbody>
</table>

Notes: ASA = American Society of Anesthesiologists physical status classification; ASA-IIIa (N = 759) = ASA-III and functionally independent patients; ASA-IIIb (N = 290) = ASA-III and partially or fully partially dependent patients.

*Statistical difference.
When comparing outcomes between the two ASA subgroups for the most common surgical specialties at this hospital system (general surgery, orthopedic surgery, urology, and vascular surgery), IIIB patients had significantly worse mortality irrespective of the type of surgery. Few patients underwent ophthalmologic, plastic, thoracic, otolaryngological, podiatric, and other types of surgery, not allowing for appropriate statistical analyses among these surgical specialties. Orthopedic (HR = 2.59, p < .001) and vascular surgery (HR = 2.18, p < .001) ASA-IIIB patients had the greatest risk of mortality, but this observation is not as pronounced in urologic surgery ASA-IIIB patients (HR 1.46, p = .04).

Multivariate analysis with survival as the primary outcome was performed; significant variables are depicted in Table 3. The ASA-IIIB subclass was shown to be a
significant predictor of mortality after adjusting for the following factors: age, body mass index, angina, hypertension, congestive heart failure, chronic obstructive pulmonary diseases, diabetes mellitus, dialysis, disseminated cancer, history of cerebrovascular accident with neurological deficits, peripheral arterial diseases, critical limb ischemia, postoperative pneumonia and urinary tract infections, sepsis, and preoperative laboratory values (albumin, creatinine, bilirubin, blood urea nitrogen, sodium, hematocrit, and white blood cell counts).

**Discussion**

This was the first study exclusively conducted for octogenarians to assess whether the incorporation of patients' functional status into the ASA classification system, as defined by their capability to perform their ADLs independently, provided a more robust perioperative risk stratification system. Functionally independent ASA-III patients (IIIA) were found to have fewer 30-day complications, including significantly less mortality (3.8%) compared with their functionally dependent (IIIB) counterparts (12.1% 30-day mortality, p value <.001, Table 2). There was a marked divergence in mortality, the primary outcome, with significantly greater mortality in the more functionally dependent ASA-IIIB group for the entire 96-month period of follow-up (Figure 1). This provides strong evidence that preoperative functional status is a reliable and independent predictor of postoperative mortality.

Mortality was also significantly greater among ASA-IIIB patients when data were analyzed per surgical subspecialty, with hazard ratios for mortality ranging from 1.46 for urologic surgery to 2.59 for orthopedic surgery, compared with IIIA patients. Although patients were followed for up to 96 months, the data indicate that there was a sharp decline in survival in the early postoperative period, extending beyond the 30-day mortality statistic. This drastic early divergence in survival was observed with each surgical specialty and is depicted up to 96 months for the overall sample (Figure 1). Dosluoglu et al. showed a 28% greater survival in IIIA vascular surgery patients at 12 months, compared with those classified as IIIB, but the sample population in that study was not limited to patients older than 80 years of age (21).

There are several possible contributing mechanisms and explanations for these findings. First, in this and other study populations (22), functional status was found to be a strong predictor of postoperative mortality and may represent a crude but inclusive summary of the severity of each patient's preoperative multifactorial disease state. This functional status-dependent divergence in mortality was also found to be true in a cohort of supercentenarians, but this study did not assess perioperative outcomes (26). The genetic, pathogenic, psychosocial, and economic complexities that contribute and amount to each patient’s functional status and their contribution to patients’ perioperative risk are yet to be elucidated.

Second, differences in 30-day complications between groups were not limited to mortality. There were significantly more complications in the ASA-IIIB group (pneumonia, urinary tract infections, wound dehiscence, renal insufficiency), but surprisingly these data were not shown to independently predict mortality by multivariate analysis. Although differences between the two groups existed (Table 1), only those found to be independent predictors of mortality by multivariate analysis were considered significant. Multivariate analysis identified white blood cell count, albumin concentration, age, chronic obstructive pulmonary disease, and disseminated cancer as independent predictors of mortality (Table 3), but there were no significant difference in white blood cell values, chronic obstructive pulmonary disease, or disseminated cancer between the IIIA and IIIB groups (Table 1). Albumin was greater in the IIIA group (3.52 g/dL) than in the IIIB group (3.06 g/dL, p < .001, Table 1), and was found to be an independent predictor of mortality (HR 0.629, 95% CI 0.477–0.829, p = .001, Table 3). This is an observation that has been reported in other studies as well (10). Noting that the IIIA group also had a greater mean body mass index (Table 1), a finding that was unexpected in the IIIA group as this group, by definition, was more physically active and would, thus, be expected to have a lesser body mass index, it may be suggested that this group had a better nutritional status but this was not evaluated in this study. Other studies have also

**Table 3. Multivariate Analysis for Predicting Survival in ASA Physical Status III Patients**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hazard Ratios</th>
<th>95% Confidence Interval</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASA-IIIB/IIIA</td>
<td>1.597</td>
<td>1.149–2.219</td>
<td>.006</td>
</tr>
<tr>
<td>Age (y)</td>
<td>1.047</td>
<td>1.026–1.094</td>
<td>.04</td>
</tr>
<tr>
<td>Chronic pulmonary obstructive disease</td>
<td>1.460</td>
<td>1.061–2.009</td>
<td>.02</td>
</tr>
<tr>
<td>Disseminated cancer</td>
<td>7.799</td>
<td>3.816–15.939</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Serum albumin (mg/dL)</td>
<td>0.629</td>
<td>0.477–0.829</td>
<td>.001</td>
</tr>
<tr>
<td>White blood cell count (×1000 cell/μL)</td>
<td>1.009</td>
<td>1.002–1.015</td>
<td>.05</td>
</tr>
</tbody>
</table>

*Notes: Preoperative patient and laboratory variables found to significantly contribute to survival through multivariate analysis. Only variables found to be significant by multivariate analysis are included in this table. A list of all tested variables can be found in the body of this article. ASA = American Society of Anesthesiologists physical status classification; ASA-III (N = 759) = ASA-III and functionally independent patients; ASA-IIIB (N = 290) = ASA-III and partially or fully partially dependent patients.*
found greater body mass index to be associated with better outcomes (27,28), but additional research is needed to elucidate potential links between nutritional state, ADLs, and perioperative outcomes in octogenarians.

Age was found to be a significant predictor of mortality by multivariate analysis (Table 3) with a mean difference of 1 year of age between the two groups (Table 1). In the US 2010 Preliminary National Vital Statistics Report, life expectancy was noted to be 8.2 years for the average 80-year-old man, 9.7 years for the average 80-year-old woman, 4.1 years for 90-year-old men, and 4.9 years for 90-year-old women (29). Hundred-year-old men are expected to live 2.1 years and 100-year-old women are expected to live 2.4 years. In our study, ASA-IIIB patients were 1 year older—a variable (age) that was in itself shown to have a HR for mortality of 1.047 (p = .04, 95% CI 1.026—1.094, Table 3), which is comparable with the National Vital Statistics Report data, but does not fully account for the 23% greater mortality observed in ASA-IIIB patients at 12 months postoperatively (Figure 1). The age-adjusted 12-month mortality difference between the two groups was 18.3%.

ADLs have been implicated to impact quality of life, cognition, depression, and nutrition and may be both the cause and the summative result of many components of each patient’s disease state (30–32). Comorbidities and specific preoperative factors doubtless play significant roles in predicting various postoperative outcomes (8–10), but multifactorial formulas may be cumbersome and difficult to incorporate for routine preoperative risk assessment, thereby emphasizing the advantages of the simple and easily administered 6-point ASA classification system (6).

Although the simplicity and generalizability of the ASA classification contribute greatly to its ease of use, the system has been criticized for its simplicity, subjectivity, variability (33) and may lack robustness for specific populations (i.e., cardiac surgery, for which other scores are commonly used) (34–36). Nonetheless, the ASA classification system has repeatedly been shown to be a strong predictor of perioperative morbidity and mortality (5.7–13). Among the many risk stratification strategies and formulas, it continues to be the most commonly used method of perioperative risk stratification.

In select populations, however, a large proportion of patients fall within one or two ASA classes, limiting the utility of the ASA 6-point classification system for perioperative risk stratification. We previously reported that 77% of vascular surgery patients undergoing revascularization were classified as ASA-III, making the ASA physical status system impractical for this particular patient population (21). Similarly, in this study of VAWNY patients aged 80 or older, 65.1% of all patients were classified as ASA-III, limiting the utility of the current ASA 6-point system for individual risk stratification.

This understudied octogenarian population is presenting for surgery with increasing frequency, and the introduction of this functional status subclassification provides a simple and reliable tool for improved perioperative risk stratification. Although simple and potentially crude, each patient’s functional status may be an inclusive and summative result of his or her preoperative biopsychosocial disease state, thereby potentially explaining why this factor independently predicts postoperative mortality so significantly.

A limitation of this study stems from its retrospective nature and patient population even though the data were collected prospectively. This was a single-center study at a Veterans Affairs Medical Center and included mostly men; consequently, the results cannot be generalized to the general population as significant gender bias is possible. Gender bias may not play a major role, however, as evidence from the US 2010 Preliminary National Vital Statistics Report indicates that gender-specific differences in predicted survival are limited to 1.5 years at 80 years of age and 0.3 years at 100 years of age. Because of the observational nature of this type of investigation, the possibility of residual confounding despite multivariate analysis is possible. More robust, prospective studies involving metabolic markers, nutritional analyses, and biopsychosocial multidisciplinary assessments may further elucidate those patients at greatest risk for postoperative complications.

The goal of this study was to identify a more appropriate and simple preoperative risk assessment tool for octogenarian surgical patients because the generally reliable 6-point ASA classification is limited in this population. The simple subgrouping of ASA-III patients into IIIA or IIIB, based on functional capacity, was a very effective method for risk stratification of patients older than 80 years of age, which independently predicted both 30-day and long-term mortality.

Supplementary Material
Supplementary material can be found at: http://biomedgerontology.oxfordjournals.

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