Intensive Care Unit Outcomes of Surgical Centenarians: The “Oldest Old” of the New Millennium


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This study compared the severity of illness and outcomes of surgical intensive care unit (SICU) patients age 100 years or older with those of younger SICU patients. Severity of illness was measured with the Simplified Acute Physiology Score (SAPS) and the Quantified Therapeutic Intervention Scoring System (QTISS). Outcomes were evaluated with SICU length of stay (LOS), hospital LOS, SICU mortality, and hospital mortality. All patients admitted to an urban, tertiary-care SICU from August 1, 1986 to July 31, 1998 (12 years) were included. A total of 24,395 consecutive patients were evaluated of whom nine (0.037%) were age 100 or more. Complete outcome data were available for 13,773 patients who were divided into five groups on the basis of age: <70, 70 to 79, 80 to 89, 90 to 99, and 100 years and above. Nine centenarians were admitted to the SICU of whom one died in the SICU and another died in the hospital after SICU discharge (22.2% overall mortality). Centenarian patients had higher SAPS and QTISS on admission than patients in all other groups, although this difference was not significant because of the small number of centenarians. SICU and hospital LOS were not significantly longer for centenarians. Mortality in the SICU and hospital was significantly different across the age groups and rose with age. However, the modest 11.1 per cent SICU mortality rate in centenarians along with their LOS statistics indicate that these patients fare relatively well in surgical intensive care.

THE ELDERLY REPRESENT the fastest-growing population in the United States. Medically the term “oldest old” has usually implied patients age 75 and over and sometimes patients 85 years and over. However, the most rapidly growing segment of the U.S. population comprises centenarians who now number 70,000; this figure is up from 37,000 in 1990.¹ One million centenarians are projected to be alive by the year 2050. Although there are several reports of outcomes of centenarian patients undergoing surgical procedures there are essentially no reports of centenarian outcomes for surgical intensive care.²,³ The present study was designed to compare the severity of illness and outcomes of centenarians admitted to a tertiary surgical intensive care unit (SICU) with the severity and outcomes of younger groups of SICU patients.

Materials and Methods

This study was conducted at an urban 850-bed hospital with a Level I trauma center and multiorgan transplant center. The SICU has 20 beds and admits more than 2000 patients annually. The medical records of all SICU patients were prospectively collected by a computerized clinical information system (CIS) (CareVue 9000 CIS, Agilent Technologies, Inc., Andover, MA).⁴ All patients admitted to the SICU from 8/1/86 to 7/31/98 (12 years) were evaluated. Admission severity of illness was measured with the Simplified Acute Physiology Score (SAPS) and the Quantitative Therapeutic Intervention Scoring System (QTISS), which were automatically calculated by the CIS.⁵,⁶ Intensive care unit (ICU) length of stay (LOS) was measured by the CIS. Hospital LOS and survival information was extracted from the hospital information system. Survival to ICU discharge and survival to hospital discharge were the primary outcome indicators. Disposition upon hospital discharge was also tabulated. All data were transferred to a relational database for analysis. Patients were divided into five groups on the basis of age: <70, 70 to 79, 80 to 89, 90 to 99, and 100 years.

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and above. Statistical comparisons were performed with EquivTest 1.0 (Statistical Solutions, Inc., Cork, Ireland). Comparisons between multiple-group means were performed with one-way analysis of variance (ANOVA). The Chi-square analysis was used to evaluate discrete differences between groups such as SICU and hospital mortality rates. $P < 0.05$ was used as the measure of statistical significance. This study was approved by the Cedars-Sinai Medical Center Institutional Review Board.

**Results**

A total of 24,395 consecutive patients were evaluated; of these, nine (0.037%) were age 100 or more. Eight of the nine centenarians were admitted to the SICU immediately after surgery including one major trauma patient who underwent craniotomy to evacuate a subdural hematoma. This patient died in the SICU. Four centenarians received orthopedic procedures for hip fractures, and one received a femoral-tibial bypass graft. Two centenarians were status postgastrointestinal surgery. One centenarian with gastrointestinal bleeding was admitted as a medical service patient. The craniotomy patient died in the SICU, and the medical patient died later in the hospital after SICU transfer for an overall mortality of 22.2 per cent. Of the seven surviving centenarians, three were transferred to a skilled nursing facility, one was transferred to a rehabilitation facility, two were discharged to home with home care services provided, and one was discharged to home in a routine manner. Complete outcome data were available for 13,773 patients.

The overall distribution of patients by age decade is shown in Fig. 1. The mean patient age was 59.9 ± 0.2 years with a median of 66 years and a mode of 70 to 79 years. Admission severity of illness as measured by SAPS and QTISS SICU rose steadily with age (Table 1). However, statistical differences in severity were most pronounced only when the two youngest age groups, <70 years and 70 to 79 years, were compared with the older groups. As the groups advanced in age, severity comparisons became statistically insignificant.

Outcome results are shown in Table 2. There were no significant differences in SICU LOS. Hospital LOS was significantly different only for the youngest group, <70 years, when compared with the 70 to 79 and 80 to 89 age groups. Chi-square analysis revealed significant differences in SICU and hospital mortality, both of which increased with age.

**Discussion**

Centenarians are primarily women; 25 per cent live in their own home, 37 per cent in senior housing, and 38 per cent in nursing homes. Of this group 52 per cent manage the activities of daily living by themselves or with minor assistance. Genetic factors affecting human longevity have been identified in centenarians.

Surgery in centenarians is not without risk; however several studies have shown that it can be relatively safe. A large study with 31 centenarians receiving 42 procedures documented a 30-day mortality rate
Prehospital nutritional status may play a large role in the outcome of surgical centenarians. Speculating that “centenarians should have spent most of their lives in excellent health,” Hitt et al. wrote that “the older you get, the healthier you have been.”

McCann and Smith reported a 0.03 per cent incidence of surgery in centenarians over a 15-year period; this was similar to the 0.037 per cent incidence of centenarians admitted to the authors’ SICU. They reported a 12.5 per cent operative mortality which is similar to the results of the current study. McCann and Smith stated that “age alone should not be a determining factor of whether or not” a surgical procedure is performed. Cogbill et al. reported a 6 per cent mortality in 11 centenarians undergoing surgery at one institution over an 11-year period. However, none of the 16 patients underwent relatively minor procedures under local anesthesia and were unlikely to have been admitted to an ICU.

In the present study, admission severity of illness rose with age as did ICU LOS. However, hospital LOS did not increase with age. Significant differences in severity of illness were seen when the youngest age groups were compared with the older groups but not when the older groups were compared with the centenarians. The same was true with the three outcome measures. Although severity of illness and worse outcomes increase with age, the differences become smaller and smaller. More importantly the outcome of centenarians remains proportionate to their admission severity of illness. This finding is similar to the report of Margulies et al. of nonagenarian SICU outcomes in which survival was proportionate to SAPS rather than age per se.

Although the numbers were small, centenarian mortality in the present study was only 11.1 per cent in the SICU and 22.2 per cent overall. The centenarian outcome from surgical critical care is proportional to severity of illness and not age. For that reason, age alone should not be a determinant of who does or does not receive surgical care, including surgical critical care. Patients 100 years of age and older who have operable diseases or injuries should not be denied surgical interventions because of perceived risks associated with their advanced age.

**REFERENCES**


